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COMPARATIVE ANALYSIS OF YOGA, DIET REGULATED AND COMBINED GROUPS ON SELECTED MOTOR FITNESS PHYSIOLOGICAL AND BIOCHEMICAL VARIABLES AMONG OBESE WOMEN

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HUMANITIES AND SCIENCES

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has been admitted to the Degree of

DOCTOR OF PHILOSOPHY
IN
PHYSICAL EDUCATION AND HEALTH SCIENCE

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Dr M Mahalingam

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Dr MGR Educational and Research Institute

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Department of Physical Education and Sports

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A THESIS

Submitted by

MAHALINGAM M

in partial fulfillment for the award of the degree of

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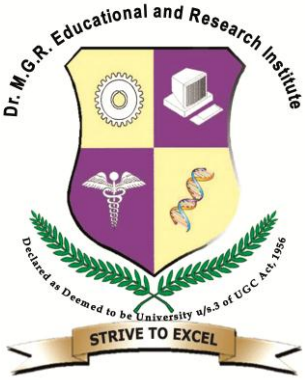

Department of Physical Education and Health Science
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AUGUST 2015

ABSTRACT

The aim of this study was to provide two different treatments in combination with the yoga training to sensitize female population about the other physical activities which may contribute for their fitness avoiding monotony of activity thereby helping them to find peace and immunity, improved abilities and processing efficiency with their abilities and skills. The scholar tried diet restriction to one experimental group and combined yoga and diet restriction to another experimental group. It would contribute to the society at large to have a healthy and active life if the experiments in the study are proved encouraging.

The independent variables chosen for this noble cause were yogic, diet regulated and the combination of yoga and diet restriction groups. Keeping yoga training as a constant, diet regulation and yoga were combined to try out a new, innovative and a really interesting package. One group performed yoga for five days a week, and the second group had only diet regulation and the third group had yoga training for five days a week with diet regulation like the second group.

The present study was to compare the selected motor fitness, physiological and biochemical variables among women of age between 35 and 45 years. To achieve this purpose, 120 female walkers who had not participated in any form of competitive sports from Ambattur town in Chennai city were selected at random for this study. They were selected from among 200 regular walkers in the park to reduce their body weight. After briefing, 120 women volunteers were selected. They were explained about their role in the study and they were requested to extend their best cooperation in making the purpose of the study meaningful and useful to other public at large.

Yogic exercise group consisted of 30 women who performed a set of 6 yogasanas three times daily for 45 minutes for five days in a week under the supervision of the scholar in the school auditorium between 5 and 6 pm. The schedule is given below. They brought their own yoga mattress and after every session the feedback from the participants and they were counseled properly. Each asana was done for 10 to 15 seconds to the ability of individuals.

The diet regulated group consisted of 30 female subjects, who were asked to follow a regulated diet pattern, Morning after getting up, they were asked to take 100 ml of a juice prepared by themselves at home with gooseberry, ginger, garlic and mint leaves. The method of preparation and the quantity of each constituent were demonstrated to the group before the experiment and the scholar was satisfied with their preparation.

The combined group consisted of 30 female subjects of the same age group and they were given yoga training same as the yogic exercise group and performed a set of 6 yoga asanas three times daily for 45 minutes for five days in a week under the supervision of the scholar in the school auditorium between 5 and 6 pm. They brought their own yoga mattress and after every session the feedback from the participants and they were counseled properly. They were also instructed to follow the same type of food prescribed for the diet regulated group. Then for the breakfast, they were asked to replace their regular menu with rice preparations and supplement it with ragi porridge, the method of preparation of which was also demonstrated to all the subject by the researcher. The quantity of intake was left to the participants. Evening snacks was permitted to their taste. Afternoon lunch was permitted to their choice with rice preparations. They were advised to restrict the intake of eggs, mutton and beef during the period of the experiment. Night dinner with rice or other preparations they usually take was replaced by ragi idly. The method of preparation of which was also demonstrated by the researcher. The quantity of intake was left to the participants. This group was allowed to do their regular work but they were not permitted to be a part of any organized physical activities and competitions.

The data were collected from the yogic, diet regulated and the combined groups on selected motor, physiological and biochemical variables among women of age groups between 35 and 45 years. The experimental design for the study was static group comparison design. analysis of covariance ANCOVA was used to find out the difference among the yogic, diet regulated and the combined groups on selected motor, physiological and biochemical variables. As the obtained F-ratio was significant, the Scheffe's test was used as a post-hoc test to find out the significant difference between each variable. In all the cases, 0.05 level of significance was used to test the hypotheses.

The following conclusions were made on the basis of the findings of the study.

1. It was inferred that the combined group had improved the agility level, hip flexibility level and body mass index level than the yogic group and the dieting Group.
2. It was inferred that the combined group had improved the systolic blood pressure level than the yogic exercise group and diet regulated group.
3. The yogic group had improved the low density lipoprotein level than the diet regulated group and the combined group.
4. It was inferred that the combined group had improved the high density lipoprotein level and the random blood sugar levels than the diet regulated group and the yogic group

The following recommendations were made on the basis of the findings of the study.

1. This type of study might help to find out the obesity levels of adolescent boys and girls.
2. This juice of gooseberry, ginger, mint leaves and garlic might open a flood gate to reduce the lipid levels of obese men, women and children.
3. This same juice might help in reducing the BMI levels and the Random Blood sugar levels.
4. This study may be conducted for men of age above 50 years to improve their mobility
5. The combined programme may be tested for school boys and girls.
6. Different type of diet restrictions could be implemented to improve the vital signs.
7. The same study could be undertaken with different motor fitness variables.
8. The same study could be made with different physiological variables
9. The same study could be attempted with different biochemical variables.

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List of Symbols and Abbreviations

6MWT	6-Minute Walk Test
ACE	Angiotensin I-Converting Enzyme
AEB	Abnormal Eating Behaviors
ALI	Atherogenic Lipid Indices
ANS	Autonomic Nervous System
AOA	Anti Oxidant Activity
BH	Bhastrika
BMI	Body Mass Index
CHD	Coronary Heart Disease
CRP	C-Reactive Protein
CVD	Cardio Vascular Disease
DM	Diabetes Mellitus
EBs	Elastic Bands
HRV	Heart Rate Variability
HRV	Heart Rate Variability
hs-CRP	high-sensitivity C Reactive Protein
HTN	Hypertension
HY	Hatha Yoga
KB	Kapalabhati
KPU	Knee Push-Up
MDA	Malondialdehyde
MIs	Myocardial Infarctions
NIDDM	Non–Insulin-Dependent Diabetes Mellitus
OPA	Organized Physical Activity
PT	Power Training
RPE-AM	Rate of Perceived Exertion in Active Muscles

SES	Socio Economic Status
T2DM	Type 2 Diabetes Mellitus
TAC	Total Antioxidant Capacity
TNRs	Targeted Number of Repetitions
TRT	Traditional Resistance Training
TSH	Thyroid Stimulating Hormone
WMs	Weight Machines

Chapter I

Introduction

Man is destined to keep moving throughout his life. He started moving inside his mother's womb and he should stop moving only when he is dead. Human development in the field of science and technology has made humankind invariably lazy and lead a sedentary life. The science and technology is advancing in a rapid speed that the life styles of humans are becoming very convenient. The people those who invent for humanity are of the view that their inventions would help humans to live happily. But the results are reverse. Their inventions make the human population skip walking, abolish climbing staircases and eliminate even simple movements. The human effort in their daily living is taken care of by machines. Machines and materials have made humans more lethargic and spend their times in a chair. This is one of the reasons for health problems at later stage.

Physical fitness should be an important part of all people's life no matter what age or gender. A healthy life style is something that will not only help us to live longer but will help the years we live to be more enjoyable. Everyone needs good nutrition and physical activity to give their bodies the best possible chance of health and longevity. Exercise is an essential component of fitness during which endorphins are released which helps teens deal with stress. Thus, being fit can be a way for teens to let off stress. Physical activity is a healthy outlet for problems like anger and stress that tend to plague teenagers during the difficult transition into adulthood.

The following episode is an excellent eye opener for those who are desirous of doing some exercises to keep themselves fit. Many a cousin, aunt and uncle in her family was a fitness freak. From walking and running to cycling to yoga to dancing, to kalaripayattu, to mountain-climbing and mountain-biking, they did it all. In fact, they couldn't go without it for a single day. And then, there was she. She joingly said that she was a yoga person; she did her shavasana every single day! To those who didn't know, it was the corpse pose in yoga.

She further added that for most of us, exercise was a huge ordeal. Taking a walk to the nearby shop to buy groceries was mostly replaced by a trip on the motorbike, sometimes even the car. Need to go to the first floor, take the lift instead of the stairs. The easiest excuse anybody came up with: no time. Therefore we do miss out on the simplest flexing of our muscles and joints.

In her case, she loved any kind of physical activity. Except, she needed someone to coax her into it; sometimes a little more forcibly, to the extent of letting them drag her out of her comfort zone, figuratively and literally. Sometimes, though very rarely, the mirror managed to do it. When she looked into the mirror and found that she had had made some really 'flab' friends, she groaned aloud at their sight and made plans to get rid of them quickly.

Or might be that fine day her father remarked that she was getting lazy and fat. With determined enthusiasm and zest, she decided to get back into shape, on Day 1 itself. That's how ridiculous it usually was. Realization dawned a little late the next day as she went back crawling into bed, sore with pain. Strenuous workout on the first day: very bad idea.

Maybe sometimes rewards would work just as fine. Back in her undergraduate days her college had the credit system, which would ensure everyone did something apart from academic activities in order to earn their compulsory credits over the three years. She enrolled herself for yoga as a credit course. She managed to persuade a couple of her friends into going with her too. They struggled with the rest of the class as they tried touching their toes, or balancing themselves on one foot (even with our eyes open), or lifting their feet a few centimeters off the ground while lying down. After the initial weeks, their yoga instructor, seeing no improvement at all, finally decided to give them the much-needed quote, "Your legs have been carrying you all these years, and you can't do them a favour and even lift them off the floor for a few seconds? What a shame." Somehow, for her it worked wonders and put things into shape, pun intended.

Subsequently she also signed up for a self-defense class outside of college hours on the assumption that she could get my credits. She worked hard, learnt her katas, fought her opponents, showed off her purple-blue bruises to anyone who'd ask.

When her brother forced her into accompanying him for the ‘Learn to Swim in 15 days’ at a pool nearby, she realized it was the best way to beat the heat and also earn her credits. While it took her close to 10 days to learn just the basic strokes, her brother had mastered a lot more. As they neared the end of their coaching, she had managed to swim the entire length of the pool from the six-foot end to the four-foot end, a huge accomplishment in itself.

Reverse strategies seem to work for her. A physically challenged coach who had been watching her told her to swim back. She was exhausted and told him that going back would be a bad idea. But he took sheer delight and said that those four- and five-year old kids swam to the six-foot end, and asked her how old she was. Sometimes, it was best to ignore such comments. But her being her, she was fuming with anger for being chided, and decided to swim the reverse stretch. Hardly crossing the five feet mark, she forgot how to use the breathing technique I she was taught. The exhaustion, too, took its toll and it was difficult to stay afloat. She let go, and hit the bottom of the pool. Her mind was shrieking and telling her if she didn’t take the one last effort she would lie there until somebody found her. So, she did it, she shoved herself up to the surface, towards the wall of the pool. She survived it. In fact, the coach had rushed another coach to help her after she didn’t surface for some time. She was glad for it, in spite of herself. And, if you’re waiting to know if she earned those credits: yes, she partially did, only for yoga though, the other two were purely exhilarating experiences that she would love to continue.

Almost four years since, she still waited for that egging and prodding from somebody before she restarted her exercise routine. As of now, she is back on that yoga mat, dutifully doing her suryanamaskar, and the other asanas that she learnt. Shavasana, the ultimate asana that made her appreciate the effort of the sweaty exercise, as she cooled off, was still one of her favorites. She was defending her stand there, so you might want to find out about its benefits before you disagree with her!

A wonderful example of how people desire, attempt and fail, again try and try and succeed in getting rid of the excess weight and to keep the body trim. Effort and loving the

pain after exercise only would keep anyone on the routine. If anyone who loves best and sleep might fail in their attempts. Nothing wrong in their desire to do exercises but the perseverance is the important element. (Ananya 2015).

1.1. Innovations of the study

Because of their laziness, housewives have no time to prepare food at home. They seek for expedient and tasty stuff from hotels and fast food vendors. They eat food without knowing their names. Sedentary life style and eating foods of huge energy potential lead to mobility problems even at younger age. Eating more and doing nothing is the problem to the future wellbeing. These two, movement and eating good food would go a long way in deciding anybody's future health. If the connection is well understood, then mankind will have a better and healthy life.

The aim of this study was to provide two different treatments in combination with the yoga training to sensitize female population about the other physical activities which may contribute for their fitness avoiding monotony of activity thereby helping them to find peace and immunity, improved abilities and processing efficiency with their abilities and skills. The scholar tried diet restriction to one experimental group and combined yoga and diet restriction to another experimental group. It would contribute to the society at large to have a healthy and active life if the experiments in the study are proved encouraging.

Malhotra Noakes and Phinney (2015) had quoted the UK's Academy of Medical Royal Colleges that described 'the miracle cure' of performing 30 min of moderate exercise, five times a week, as more powerful than many drugs administered for chronic disease prevention and management. Regular physical activity reduced the risk of developing cardiovascular disease, type 2 diabetes, dementia and some cancers by at least 30%. However, physical activity does not promote weight loss. In the past 30 years, as obesity has rocketed, there had been little change in physical activity levels in the Western population. This placed the blame for our expanding waist lines directly on the type and amount of calories consumed. However, the obesity epidemic represented only the tip of a much larger iceberg of the adverse health

consequences of poor diet. According to The Lancet global burden of disease reports, poor diet now generated more disease than physical inactivity, alcohol and smoking combined. Up to 40% of those with a normal body mass index would harbour metabolic abnormalities typically associated with obesity, which include hypertension, dyslipidaemia, non-alcoholic fatty liver disease and cardiovascular disease.

1.2. Independent variables

The independent variables chosen for this noble cause were Yoga, Diet Restriction and the Combination of Yoga and Diet Restriction. Keeping yoga training as a constant, diet restriction and yoga were combined to try out a new, innovative and a really interesting package. One group performed yoga for five days a week, and the second group had only diet restriction and the third group had yoga training for five days a week with diet restriction like the second group.

In today's nuclear family structure in Indian Society, the scene in the homes in every morning where the husband goes to office and the children to school is very pathetic. The scene would look like a battle field. After waking up in the morning, she begins her routine after a cup of coffee and by the time she sees off the children to school and the husband to the office, the morning time would have bade farewell to the homemaker woman. After arranging the home from the morning hurry, sweeping and mopping the home, collecting all the kitchen utensils and dumping them in the kitchen sink, when she sits for her breakfast, it would have been nearing the afternoon. The work for the preparation of food for the afternoon would be in wait. Because of having the breakfast late in the morning around 11 am, it would automatically drive the lunch to 3 pm.

Sekhar Deotale and Reddy et al. (2015) suggested that obesity could occur in any age, and generally increased with age. They argued that the aetiology of obesity was complex, and was one of multiple-causation. They declared that the first adverse effects of Obesity to emerge in population in transition were hypertension, hyperlipidaemia, glucose intolerance, coronary heart disease and the long term complications of Diabetes. Hence, in their opinion, it was necessary to detect the obesity at the early age and effectively correct the obesity during

childhood and adolescence by advocating some life style changes. Hence they chose to study the following:

I. To determine the prevalence of Obesity in high school children
II. To study the some risk factors of Obesity

The present community based cross sectional study was conducted at urban area of Eluru during the period from July 2010 to October 2010 with the help of Community Medicine staff. A total of 258 high school children were selected from two different schools randomly and prior permission taken from concerned authorities. Importance of the study was explained to the school management and teachers. Pretested study questionnaire was filled and the height, weight, Body mass index and waist hip ratio were recorded in both sexes. Diagnosis of Obesity was based on Body mass index >25, BMI 18.5 to 25 taken as normal as per the WHO technical report guidelines. Results were critically analyzed and necessary statistical tests like proportions and chi square tests were applied.

Out of 258 students, 157 were boys and 101 girls. Prevalence of Obesity in the study population was 9.3%. Out of 24/258 (9.3%) obese individuals there were 16 girls and 10 boys. About 84% boys were taking junk food and 90% girls were consuming junk food. About 71.7% were spending 1 hour time on watching TV, 23.3% were spending > or = 2 hours time on watching TV and remaining 5% were not watching the TV in their houses. Obesity was significantly associated with female sex, junk food consumption, practice of exercise and watching TV ($P<0.01$).

The prevalence of obesity was found to be higher as compared to other studies. We recommend that there is a need for checking simple body mass index and waist/hip ratio were useful to assess obesity in high school going children. So that simple life style modifications and nutritional advice to the students can be initiated as early as possible and also periodical school surveys must be taken up for early identification of obesity. Wide IEC programmes about healthy dietary practices for children must be advised.

Housewives might think that they can have their breakfast after sending the children and husband with relaxed feeling. But do the hormones of the body know this philosophy?

Eating at inappropriate times would normally bring in heartburn. They might ignore it by considering it just heartburn only. But, that would kill the peace of mind of the day and cripple their routine. Eating at unsuitable times would spread red carpet to stomach ulcers. Ulcers invite other related discomforts and problems. Apart from that, our ladies at home under the pretext of taking rest watch TV by unconsciously eating unwanted and unhealthy snacks like chips. Otherwise they go to sleep. But those are very bad to the health of the housewives. This careless attitude is one of the reasons behind the obesity among the ladies. Obesity is not an isolated phenomenon. It provides a favorable climate inside the body system like the uterus related complications and joint pains.

Jabs Devine et.al. (2007) sought to develop an understanding of how employed mothers constructed time for food provisioning for themselves and their families. Thirty-five low-wage employed mothers were purposively recruited to vary in occupation, race/ethnicity, education, household composition, and age using workplace, community, convenience, and snowball sampling. Most mothers expressed feelings of time scarcity. Mothers described 3 time styles that reflected how they constructed time. Time styles reflected mothers' experiences of strain and time scarcity, usual time management strategies, and sense of control over time. Mothers prioritized feeding their children but wanted to complete meals quickly in order to move on to other tasks. Recognizing issues of time scarcity and individual differences of time styles and time management strategies can help researchers better understand food choice practices and assist practitioners in identifying practical food provisioning strategies for low-wage employed mothers. Food policies and recommendations should be evaluated for their relevance to the time scarcity and work strain issues that these mothers faced.

Even during the night, the story is the same. After preparing and serving dinner to the members of the family, she will be the last person to have her dinner. By the time she completes her dinner and night cores, most of the times, all the other members would have gone to their bed and slept. So, she eats quickly and due to the tiredness owing to the continuous work from the morning, she falls in bed and sleeps off immediately.

Rachiwong et al. (2015) conducted a study on 40 female between the age group of 35-45 years as subjects from various yoga training centers of Jind. The subjects were purposively

assigned into experimental and control groups. Cardiovascular Endurance and Body Composition were selected as variables of the study. Subjects from experimental group were subjected to 8-weeks of yogic practices. The training consisted of a variety of yogic asanas. Cardiovascular Endurance was administered to assess aerobic fitness. Body Composition test was administered to estimate a person's percent body fat. SPSS statistical software (version 16.0) was used to analyze student's t-test. The 't' value of experimental group 5.62 was found statistically significant at .05 level of significance. The 't' value in case of experimental group on body composition was 16.64 which was statistically significant. Their study confirmed that yogic practices were useful in reducing the body fat percent and thereby the body mass index and improved the aerobic fitness of females between 35to 40 years of age.

Sleeping at night without giving some gap for the preparation of digestion and sleeping immediately after eating would lead to indigestion. That would lead to constipation. Constipation is the entrance to all the other related complications. Because of following the above daily routine for years together, diseases that would create greater risks like obesity and diabetes. Such diseases restrict the movements of their body. The energy required for the normal function of the body becomes scarce. Irritation and uneasiness are caused due to the lack of iron in the blood supply to the brain and ultimately they become anemic. Then it becomes unavoidable to lead daily life with medicines and tablets.

To avoid reaching that stage, every homemaker lady should consider showing not little but supplementary care. In spite of the pressing morning work, she has to squeeze at least 15 minutes amidst the routine for having her breakfast in time. Time is an important element to the employed ladies also. They have to complete their morning cores hastily. In their rush to complete within the time limit, they are forced to use the readymade ginger-garlic paste and other preservatives added packet food stuff. Using them once in a while becomes regular due to their convenience and time saving nature. But our leaning towards them and using such food stuff never rings the bell inside the brain. We must know that such food stuff contain numerous stabilizer chemicals. Eating them regularly increases the salt level in our body and the kidneys have to work overtime to remove such additional salt ingestion.

The same type of physical damage happens to the children when they are given money and asked to have their food outside due to our lack of time to prepare food. In our society, many institutions function with unrealistic work shifts. If the shift begins at 8 am, when to get up? When to cook? When to eat? Because of unable to find an answer to the above questions, many of our ladies decide to have their food in the canteen or manage with tea or can take biscuits. But many of them miss all and directly go for their lunch.

In the evening when they return home carrying the fatigue and exhaustion from their office, they look for some easy way for their dinner. They either buy readily available idly dough. They prepare chutney for three days and store them in the refrigerator. When they prepare chilly recipe, they use for one week by storing it in the fridge. Remember, a match stick loses its capability in one day if it is kept outside, think about the food we eat if they are used many times by storing them for a week. So, use the vegetables we get from the plants or trees when they are fresh. We can save money but never try to save the cooked food by storing them.

It is very nice to talk and listen but how to overcome this? We need a place to sit and eat if we have a variety but we don't need a surrounding to drink the ragi porridge with buttermilk and little salt when we are hungry. It is very advisable to have the ragi porridge or broken rice water in the morning. Our ladies do not have the knowledge of a balanced diet. Mindlessly they go on eat carbohydrate or protein regularly. They must know the technique of making powder of many grains and mix them in milk or buttermilk and drink when they are hungry. Porridges and juices made out of raw vegetable with lemon juice and salt would prevent them from taking deep fried food stuff. Above all, the house wife must make it a habit of sitting with all the family members and have the dinner with pleasure and happiness. This would improve the general physical health and increase the mental happiness.

Errickson et al. (2015) were of the opinion that obese adults were at an increased risk for mobility-related problems. They gave example of their national guidelines recommendation that calorie restrictions and exercise for obese adults as a means to improve functional fitness capacity and to increase mobility. They were of the opinion that lifestyle weight loss interventions often failed to measure fitness changes. The aim of their study was to

assess whether a 1-month, intensive behavioural change, diet and fitness intervention for overweight and obese adults would result in statistically significant and clinically meaningful changes in functional exercise. A pre–post test design was used in this study. Seventy-two participants (40 women, 32 men; mean baseline body mass index (BMI)=42.6+9.0; mean age=45.8+16.8) completed a modified 6-minute walk test (6MWT), performed on a treadmill, at baseline and at end of treatment. Significant improvements included decreased BMI ($2.7+1.7 kgm^{-2}$, $p < 0.001$) and increased 6MWT distance (66.4+73.0m, $p < 0.001$). The 6MWT improved by 66m on average, a reported clinically meaningful difference. Greater improvements in the 6MWT were significantly correlated with greater weight loss and BMI reduction. Their findings suggested that rehabilitation beyond weight loss might be derived from participation in a brief, intensive behavioural change, diet and fitness programme. They advised the physiotherapists that they were in a prime position to address the physical and motivational challenges participants faced while living with severe obesity: targeting functional exercise capacity was one key strategy for addressing immobility associated with obesity.

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Also, our ladies are not encouraged to walk a few 100 meters even when they can. But they prefer to cover shorter distances by share autos. They never choose to use the staircase but they use the elevators and escalators. They think that their standing in the kitchen during

their morning cores and their work in offices are enough to keep them fit and healthy. It is a very serious misunderstanding that they fail to differentiate the work and the exercises and the exercises would keep them at ease to perform their work with energy and efficiency. They would never venture into any type of exercise regimen unless some sort of initiation is done after regularly convincing them to do exercises.

Next problem is, what they eat is mechanically eaten without the knowledge of the quality and the necessity of the stuff and it is worse than eating at odd hours. They are attracted by the appearance, aroma and the taste of the food. They never have time to look into the junk quality of the food. Right from the morning coffee or tea till the end of the dinner, if they look back, they have no idea of how much they have swallowed unwanted and non nutritional stuff. So, this is the knowledge quality of our women.

Taking into considerations of our housewives and the employed women, the scholar chose to help them by improvising some exercises which are very simple and easy to do without the regular discomforts of exercises like sweating and heat. Also, he devised some dieting pattern with a slight change in their daily routine. He prescribed some corns, roots, leaves and gooseberry as a supplement.

The scholar made an attempt to compare selected motor, physiological and biochemical variables among women of age groups between 35 and 45 years to find a suitable solution for this abiding problem and to help the housewives to have a better physical and mental health conducted a study.

1.3. Heart Rate Adaptations of Yoga Training

Heart rate is acutely elevated immediately following a workout and affected by the amount of resistance, the number of repetitions and the muscle mass involved in the contraction. Interestingly, in terms of chronic adaptations, there appears to be a reduction in heart rate from yoga training, which is considered beneficial

According to Sawane and Gupta (2015) resting heart rate variability (HRV) was a measure of the modulation of autonomic nervous system (ANS) at rest. Increased HRV

achieved by the exercise was good for the cardiovascular health. However, prospective studies with comparison of the effects of yogic exercises and those of other endurance exercises like walking, running, and swimming on resting HRV were conspicuous by their absence. Their study was designed to assess and compare the effects of yogic training and swimming on resting HRV in normal healthy young volunteers. Study was conducted in Department of Physiology in a medical college. Study design was prospective randomized comparative trial. One hundred sedentary volunteers were randomly ascribed to either yoga or swimming group. Baseline recordings of digital electrocardiogram were done for all the subjects in cohorts of 10. After yoga training and swimming for 12 weeks, evaluation for resting HRV was done again. Percentage change for each parameter with yoga and swimming was compared using unpaired *t*-test for data with normal distribution and using Mann-Whitney U test for data without normal distribution. Most of the HRV parameters improved statistically significantly by both modalities of exercise. However, some of the HRV parameters showed statistically better improvement with yoga as compared to swimming. Practicing yoga seem to be the mode of exercise with better improvement in autonomic functions as suggested by resting HRV.

1.4. Blood Pressure and Lipid Adaptations to Yoga Training

Gadham and Srikanth (2015) had observed that hypertension was a major chronic lifestyle disease and an important public health problem worldwide. Mind-body therapies i.e., the transcendental meditation and Yoga had raised interest as they represented an alternative to medication; also contributed to an increased feeling of empowerment for patients in preventing and treating hypertension. Yoga, as a therapeutic regimen, had been shown to be useful to individuals with cardiovascular diseases and diabetes. The objective of their study was to study the effect of Pranayama and certain Yogic Asana's on BP, BMI & lipid profile. 50 male subjects in the age group of 35-55 years were randomly selected based on exclusion criteria. BP, BMI and lipid profile was estimated before any intervention. They were subjected to pranayama and other Asana's for a period of 3 months. After 3 months of Yoga intervention, BP, BMI and lipid profile was estimated. They observed a statistically significant decrease in Systolic BP, Diastolic BP and BMI after 3 months of Yoga training. Also, they observed a decrease in total cholesterol, VLDL, triglycerides and an increase in HDL

cholesterol which was not statistically significant. They concluded that a significant decrease in systolic blood pressure and diastolic blood pressure in subjects who had practiced Yoga, Asanas along with pranayama technique for 3 months duration.

1.5. Diet Regulations and Metabolic Disorders

Mondal Kundu and Saha (2014) suggested that Yoga was generally safe, simple to learn, and could be practiced by even ill, elderly or disabled individuals. Yoga had been shown to have therapeutic benefits for individuals with a wide range of health conditions. The present study was conducted to assess the effect of 12 weeks of yoga therapy on blood sugar and lipid profile in elder women. Twenty elderly (age range 50 to 70 years) women were recruited from two old age home and randomly divided into two groups (n=10) of yogic practice group and control group. Yogic practice group were subjected to regular yoga practice (Asanas, Kriyas, Pranayamas) for 12 weeks (3 sessions per week, 45 minutes per session), while the control group did not participated any regular activity. The dependent variables were fasting plasma glucose, post-prandial blood sugar, total cholesterol, triglycerides, low density lipoprotein, very low density lipoprotein and high density lipoprotein and were examined before and after 12 weeks of yogic intervention in both groups. A significant ($p \leq 0.05$) decrease in fasting plasma glucose, post-prandial blood sugar, total cholesterol, triglycerides, low density lipoprotein and very low density lipoprotein; with a significant ($p \leq 0.05$) increase in high density lipoprotein level from its initial value; while showing insignificant result in control group. Conclusions: It may be concluded that adoption of yoga on long term basis would bring proper control of blood sugar and lipid profile levels in elderly women.

Ramos-Jiménez et al. (2015) found Yoga as an ancient oriental discipline that emerged from mystical and philosophical concepts. They felt that today it is being practiced in the west, partly due to the promotion of its benefits to improve the lifestyle and overall health. As compared to non-*Hatha Yoga* (HY) practitioners, healthier and better-eating patterns had been observed in those who practice it. Agreement with the brought benefits, *HY* can be used as a therapeutic method to correct abnormal eating behaviors (AEB), obesity, and some metabolic diseases. However, the energy expenditure during traditional protocols of *HY* was not high;

hence, it was not very effective for reducing or maintaining body weight or to improve cardiovascular conditioning. Even so, several observational studies suggest significant changes in eating behaviors, like a reduction in dietary fat intake and increments in that of fresh vegetables, whole grains and soy-based products, which in turn might reduce the risk for cardiovascular diseases. Given the inconsistency of the results derived from cross-sectional studies, more case-control studies were needed to demonstrate the efficacy of *HY* as an alternative method in the clinical treatment of disordered eating and metabolic diseases.

1.6 Statement of the Problem

The purpose of the study was to critically analyze and compare Yogic, Diet Regulated and Combined groups on selected motor, physiological and biochemical variables among women of age groups between 35 and 45 years.

1.6.1 Delimitations

The following delimitations were applied to this study.

1. The study was confined only to 120 ladies irrespective of their profession.
2. The study was restricted to 30 ladies each for Yogic group, Dieting Regulated group, Combined group and the Control Group.
3. The age of the subjects ranged between 35 and 45 years.
4. The following criterion motor variables were selected for this study under namely Agility, Flexibility and Leg Explosive Power.
5. The following criterion physiological variables were selected for this study under namely Resting Pulse Rate, Body Mass Index and Systolic Blood Pressure.
6. The following criterion biochemical variables were selected for this study under namely Low Density Lipoproteins, High Density Lipoproteins and Random Blood Sugar.

1.6.2 Limitations

The following limitations were considered while interpreting the results of the study.

1. The previous experience and exposure of the subjects to the exercises used in this study which might have influenced while testing the variables was not considered.
2. The factors, food habits, rest period, life style and extracurricular activities were not controlled.
3. The atmospheric temperature, humidity and meteorological factors during testing were also not considered.
4. Though the subjects were motivated verbally, no attempt was made to differentiate the motivation level during the period of testing.

1.7 Hypotheses

It was hypothesized that

1. There would be a significant difference on the selected motor variables among the Yogic, Diet Regulated, Combined and the Control groups after 12 weeks of training.
2. There would be a significant difference on the selected physiological variables among the Yogic, Diet Regulated, Combined and the Control groups after 12 weeks of training.
3. There would be a significant difference on the selected biochemical variables among the Yogic, Diet Regulated, Combined and the Control groups after 12 weeks of training.

1.8 Significance of the study

a. The findings of the study would add to the existing knowledge with regard to the selected variables among the participants of the study.
b. The results of the study might provide guidance to the participants the ways to get rid of the extra weight and live a healthy life.

c. The finding of this study will add to the quantum of knowledge in the area of public health.

4. The study may help to assess the status of bio-motor variables among the Yogic, Diet Regulated, Combined and the Control groups.
5. The study may help to assess the status of physiological variables the Yogic, Diet Regulated, Combined and the Control groups.
6. The study may help to assess the status of biochemical variables among the Yogic, Diet Regulated, Combined and the Control groups.
7. A unique aspect of this work was that it included recommendations for the practical use of the research finding to the public at large

1.9 Definition of operational terms

1.9.1 Agility

Agility is the ability to be quick and graceful. You might have agility on the basketball court or in the courtroom, or even with your gaming remote. The noun agility can be used for both mental and physical skills in speed and grace. Your mental agility might allow you to follow both conversations at once (*Agility* n.d.).

1.9.2 Hip Flexibility

Range of motion is a measurement of movement around a joint. Flexibility is the range of motion around a joint, and can refer to ligaments, tendons, muscles, bones, and joints. If a joint has good range of motion then it would be able to move in all planes and directions permitted to that joint. Hip Flexibility is the ability of the hip joint to bend forward to the maximum extent (*Hip Flexibility* n.d.).

1.9.3 Leg Explosive Power

The rate of force development is at the maximum for any type of muscle action is explosive power. In activities requiring high acceleration and output, explosive power training is necessary for maximum development (*Explosive Power* n.d.).

1.9.4 Body mass Index:

Dietz & Bellizzi (1999), concluded that the body mass index (BMI; in kg/m^2) offered a reasonable measure with which to assess fatness in children and adolescents and that the standards used to identify overweight and obesity in children and adolescents should agree with the standards used to identify grade 1 and grade 2 overweight (BMI of 25 and 30, respectively) in adults.

1.9.5 Resting Pulse Rate

Böhm et al (2015) define the resting heart rate of the body (commonly called RHR) as the number of contractions of the heart that occur in a single minute while the body is at complete rest. This number will vary depending upon the age, gender, and general health of a person. There will also be a large different in the resting heart rate of athletes when compared to non-athletes. Resting heart rate is central to cardiac output and is influenced by changes occurring in numerous diseases. It predicts longevity and cardiovascular diseases, and current evidence suggests that it is also an important marker of outcome in cardiovascular disease, including heart failure.

1.9.6 Systolic Blood Pressure

When your heart beats, it contracts and pushes blood through the arteries to the rest of the body. This force creates pressure on the arteries. This is called systolic blood pressure (*Systolic blood Pressure* n.d.). A normal systolic blood pressure is below 120.

1.9.7 Low Density Lipoprotein

Lipoproteins are the form in which lipids are transported in the blood. Low-density lipoprotein (LDL) transports cholesterol from the liver to the tissues of the body. LDL cholesterol is therefore considered the "bad" cholesterol (*Low-density lipoprotein* n.d.).

1.9.8 High Density Lipoprotein

Lipoproteins, which are combinations of fats (lipids) and proteins, are the form in which lipids are transported in the blood. HDLs transport cholesterol from the tissues of the body to the liver, so the cholesterol can be eliminated in the bile. HDL cholesterol is therefore considered the 'good' cholesterol: The higher the HDL cholesterol level, the lower the risk of coronary artery disease. The average man has an HDL cholesterol level of 40 to 50 mg/dL. In the average woman, HDL levels range from 50 to 60 mg/dL (*High Density Lipoprotein* n.d.).

1.9.9 Random Blood Sugar

Random glucose test (aka capillary blood glucose) is a blood sugar test taken from a non-fasting subject. This test, also called random blood glucose (RBG) or casual blood glucose (CBG), assumes a recent meal and therefore has higher reference values than the fasting glucose test (*Random glucose test* n.d.).

1.9.10 Obesity

Obesity is a complex disorder involving an excessive amount of body fat. Obesity isn't just a cosmetic concern. It increases your risk of diseases and health problems, such as heart disease, diabetes and high blood pressure. Being extremely obese means you are especially likely to have health problems related to your weight (*Obesity* n.d.).

1.9.11 Balanced Diet

A balanced diet is a diet that is made up of carbohydrates, proteins, fats, vitamins and minerals in proper proportion (*balanced diet* n.d.).

1.10 Organization of the thesis

This section gives a clear picture of how the remaining section of this thesis is organized. In Chapter II, literature reviews on topics relating to the thesis are presented. The areas that are directly related to this thesis have been covered in detail. It also focuses on describing the

methods used in assessing the motor fitness variables, physiological variables and biochemical variables. Also, the impacts of dieting regulated studies on different life style problems faced by women in the post menopausal and premenopausal period. Chapter III presents the methods involved in the selection of subjects, organizing the testing procedures, calibration of measuring instruments, the schedule of yogasanas done and the dieting regulations prescribed to the subjects. Chapter IV demonstrates the methods of analyzing the data statistically, interpretation of the data and discussing the cause and effect of dependent variable. Chapter V summarizes the whole of the work and conclusions are drawn based on the findings of the study. Also some recommendations are made on the basis of the findings of the study and the scope for future work on the same area with different dependant and independent variables.

Chapter II

Review of Related Literature

The reviewed related literatures that have been presented in this chapter provide a clear insight and better understanding of the problem of study under focus and to interpret the results that were obtained during course of the current study. The review was confined to the libraries of Dr. M.G.R. Educational and Research Institute University, Chennai, YMCA College of Physical Education, Chennai, Tamil Nadu Physical Education and Sports University, Chennai and through the Internet (web sources). The literature in any field forms the foundation upon which all future work will be built. If we fail to build upon the foundation of knowledge provided by the review of literature, the scholar might miss some important work already done on the same area of his meeting point.

Prevalence of obesity and the metabolic syndrome is rapidly increasing in developing countries, leading to increased morbidity and mortality due to type 2 diabetes mellitus (T2DM) and cardiovascular disease. Literature search was carried out using the terms obesity, insulin resistance, the metabolic syndrome, diabetes, dyslipidemia, nutrition, physical activity, and developing countries, from PubMed from 1966 to June 2008 and from web sites and published documents of the World Health Organization and Food and Agricultural Organization. With improvement in economic situation in developing countries, increasing prevalence of obesity and the metabolic syndrome is seen in adults and particularly in children. The main causes are increasing urbanization, nutrition transition, and reduced physical activity. Furthermore, aggressive community nutrition intervention programs for undernourished children may increase obesity. Some evidence suggests that widely prevalent perinatal undernutrition and childhood catch-up obesity may play a role in adult-onset metabolic syndrome and T2DM. The economic cost of obesity and related diseases in developing countries, having meager health budgets is enormous. To prevent increasing morbidity and mortality due to obesity-related T2DM and cardiovascular disease in

developing countries, there is an urgent need to initiate large-scale community intervention programs focusing on increased physical activity and healthier food options, particularly for children. International health agencies and respective government should intensively focus on primordial and primary prevention programs for obesity and the metabolic syndrome in developing countries. (Misra and Khurana, 2008)

Cholesterol is a waxy substance that is present in our blood. It is an important component of our cell walls and other tissues, but is thought to be harmful in excess. It can lead to blockages caused by plaque formation in the heart's arteries, causing heart attacks. Such blockages can also happen in arteries in the legs, or in the brain. Cholesterol is produced in the liver, and the amount produced is influenced by our genes. The food we consume, too, has an effect on cholesterol levels. Fatty foods, especially those high in saturated fats, and foods high in simple sugars such as cold drinks increase cholesterol levels. Lack of physical activity and exercise also lead to elevated levels. We can reduce or control cholesterol levels by following a heart healthy lifestyle, which must include regular physical activity- at least 30 minutes daily – and a diet high in fruits and vegetables and low in saturated fat. Red Yeast rice has been shown to be effective in lowering cholesterol. Include garlic and flaxseed in your daily diet. Olive oil, canola oil, or other oils rich in monounsaturated fatty acids can be used for cooking in order to reduce cholesterol through food.

The ill effects of high cholesterol take time to show, and you may not realize it until it is a bit too late. Cholesterol, by itself is important because it insulates nerve cells and membranes. Being a fatty substance, it does not dissolve in blood and is packaged into protein. There is the "good" cholesterol, HDL, High Density Lipoprotein, "Bad" LDL cholesterol can stick to the smooth lining of the blood vessels, where it is absorbed, while HDL mops up excess bad cholesterol and removes it from blood vessels. Even moderate physical activity can help increase HDL cholesterol. Exercise five days a week, whether you are overweight or underweight. You can do aerobic exercises like brisk walking, cycling, swimming, slow jogging and dancing for 3 days a week for 45 minutes. All these help increase good cholesterol while reducing the bad one. Stay motivated in this area by joining a fitness group

or by teaming up with an exercise partner. Life style changes – including exercises in your daily routine - are important for a fitter and a healthier life.

You may not be eating right, so it pays to have your diet evaluated by a nutritionist to ascertain the quantity and the frequency of cholesterol rich foods you may be consuming. These can be suitably substituted with low fat and zero-cholesterol food options along with foods rich in fibre, to reduce your bad cholesterol levels. A combination of diet, exercise and lifestyle modifications work best in producing long-lasting effects. For the obese, weight reduction is the key. Some foods that help manage cholesterol levels well and must be included in your diet are: oats, nuts, kidney beans, green leafy vegetables, avocados, black grapes, green tea, flaxseeds, wheatgrass, garlic and fish. (Ashish, Leena & Purwa, 2015)

2.1. Studies on yoga and motor fitness variables

Hruda et al. (2003) studied to determine the influence of simple, progressive lower body exercise training, focusing on strength and power, on functional abilities in frail older adults. Twenty-five residents of a long-term care facility (75-94 yrs) participated in this randomized controlled trial of 10-wks duration. The exercise group (Ex, n = 18) underwent simple, progressive lower body resistance exercises, specifically aimed at improving muscle power, 3 times/wk; the control subjects (Con, n = 7) maintained their usual daily activities. Knee extensor strength and power were measured on an isokinetic dynamometer (180 degrees/s), and functional performance was assessed from a 6-m walk timed test, a 30-s chair stand, and an 8-ft up-and-go timed test, before and after the 10-wk intervention period. Significant increases were found in the Ex group for eccentric (44%) and concentric (60%) average power ($p < 0.05$), and improvements were seen on each functional test: the 8-foot up-and-go, chair stand, and walk time improved by 31%, 66%, and 33%, respectively ($p < 0.05$). No significant change occurred in the Con group. In conclusion, simple progressive exercise training, even in the 10th decade, increases muscle power and is associated with an improved performance of functional activities using the trained muscles.

Nakamura (2007) evaluated the effects of exercise frequency on functional fitness in older women participating in a 12-week exercise program. Participants (67.8 ± 4.6 years) were

divided into three different exercise groups (I, II, and III; $n = 34$) and a control group (Group C; $n = 11$). Group I participated in a 90-min exercise program once a week, for 12 weeks, while Group II attended it twice a week, and Group III attended three times a week. The exercise program consisted of a 10-min warm-up, 20 min of walking, 30 min of recreational activities, 20 min of resistance training, and a 10-min cool-down. The following items were measured before and after the program: muscular strength, muscular endurance, dynamic balance, coordination, and cardio-respiratory fitness (6-min walking distance). Comparisons of baseline and post-intervention measures showed significantly greater improvements in body weight, coordination, and cardio-respiratory fitness for Group III compared to the other groups ($p < 0.05$). In addition, the greatest improvements in body fat, muscular endurance, and dynamic balance were also observed in Group III ($p < 0.05$). However, no significant differences were found in muscular strength. Older women who participate in an exercise program three times a week gain greater functional fitness benefits than those who exercise less frequently. In order to improve functional fitness in older women, an exercise frequency of at least three times each week should be recommended.

Bottaro et al. (2007) investigated the effect of a 10-week power training (PT) program versus traditional resistance training (TRT) on functional performance, and muscular power and strength in older men. Twenty inactive volunteers (60–76 years old) were randomly assigned to a PT group (three 8–10 repetition sets performed as fast a possible at 60% of 1-RM) or a TRT group (three 8–10 repetition sets with 2–3 s contractions at 60% of 1-RM). Both groups exercised 2 days/week with the same work output. Outcomes were measured with the Rikli and Jones functional fitness test and a bench and leg press test of maximal power and strength (1-RM). Significant differences between and within groups were analyzed using a two-way analysis of variance (ANOVA). At 10 weeks there was a significantly ($P < 0.05$) greater improvement in measures of functional performance in the PT group. Arm curling improved by 50 versus 3% and a 30 s chair-stand improved by 43 versus 6% in the PT and TRT groups, respectively. There was also a significantly greater improvement in muscular power ($P < 0.05$) in the PT group. The bench press improved by 37 versus 13%, and the leg press by 31 and 8% in the PT and TRT groups, respectively. There was no significant difference between groups in improved muscular strength. It appears that in older men there

may be a significantly greater improvement in functional performance and muscular power with PT versus low velocity resistance training.

Patel and Thacker (2014) opined that stress, if prolonged or of abnormal level could lead to long term physical & psychological problems. It could result in psychosocial responses like anxiety, hopelessness, irritability, general feeling of not being able to cope with the world, behavioral disruptions, avoidance of social and occupational activities. In Indian culture it had been usually felt that males were more stressed than females. Also it was not always working women who are under stress; in fact housewives also were stressed in fulfilling family and social expectations. The purpose of their study was to assess the effect of aerobic exercise on psychological well-being of housewives. 60 housewives aged 25-45were recruited into two groups. Group A, n=30, underwent 12 weeks of aerobic exercise program, group B, n=30, which did not participate in any form of exercise program. Perceived Stress Scale Index, Psychological General Well-Being Index and Pittsburg Sleep Quality Index were included as outcome measures. After 12 weeks of aerobic exercise program, the exercise group showed a significant improvement in the pre and the post aerobic training, Psychological General Well-Being Index scores, decrease in the perceived stress score and improvement in Sleep Quality Index score. Study concludes that aerobic exercise has a beneficial effect on stress, general well-being and quality of sleep in housewives and can be used as a means of promoting psychological health in housewives.

Halder et al. (2015) conducted a study to appraise the effect of a specific Hatha yoga package on anthropometric characteristics, flexibility and muscular strength of healthy individuals of different age groups from similar occupational trade. A total of 71 participants (Group All) from Indian Air Force ground personnel volunteered and age wise divided into 3 groups - (i) Group I (Gr. - I) (n_1 = 27, 20-29 years), (ii) Group II (Gr. - II) (n_2 = 21, 30-39 years) and (iii) Group III (Gr. - III) (n_3 = 23, 40-49 years). All the participants undergone selected Hatha yoga training for 1 h daily for a period of 12 weeks. Parameters were recorded before and after the training. Pre and post training differences were assessed by Student's *t*-test. Body weight (All, Gr. - II and Gr. - III [all $P < 0.05$]), body mass index (Gr. - II and Gr. - III [both $P < 0.01$]) and fat% (Gr. - II and III [both $P < 0.05$]) were decreased significantly.

Neck circumference was increased significantly in Gr. - I ($P < 0.05$) but decreased significantly in Gr. - III ($P < 0.05$). Chest circumference (All ($P < 0.001$), in Gr. - I and II [both $P < 0.05$]), grip strength (All [left: $P < 0.01$ and right: $P < 0.05$], in Gr. - I [left: $P < 0.05$ and right: $P < 0.01$], in Gr. - II [right: $P < 0.05$] and in Gr. - III [left: $P < 0.05$ and right: $P < 0.01$]), back leg strength (group wise $P < 0.001$, $P < 0.05$, $P < 0.01$ and $P < 0.05$ respectively) and flexibility (all $P < 0.001$) were increased significantly. They concluded that Hatha yoga could improve anthropometric characteristics, muscular strength and flexibility among volunteers of different age group and could also be helpful in preventing and attenuating age related deterioration of these parameters.

Colado and Triplett (2008) designed their study to determine whether different effects on functional capacity and body composition were produced by using different devices (elastic bands (EBs) versus weight machines (WMs)) with the same resistance training program. Forty-five healthy sedentary middle-aged women volunteers were chosen and randomly assigned to 1 of 3 groups: 21 subjects trained using EBs (EBG), 14 in trained using WMs (WMG), and 10 were controls (CG). Both exercise groups trained with a periodized muscular endurance program twice a week for 10 weeks, with a total of 6 exercises per session for the major muscle groups. Exercise intensity was equalized by jointly monitoring the same targeted number of repetitions (TNRs) and rate of perceived exertion in active muscles (RPE-AM). Functional capacity was assessed by using knee push-up (KPU) and 60-second squat (S) tests. Body composition was measured using an 8-polar bioelectrical impedance analyzer. The results for both the EBG and WMG show a decrease in fat mass ($p = 0.05$ and $p < 0.01$, respectively) and an increase in both the fat-free mass ($p < 0.05$ and $p < 0.01$, respectively) and the number of repetitions in the KPU ($p < 0.05$ and $p < 0.01$, respectively) and S tests ($p < 0.01$ in both). None of the variables measured for the CG varied significantly. They concluded that, independently of the device used, the combined monitoring of TNRs and RPE-AM can be a valid tool for controlling the resistance exercise intensity and can lead to healthy adaptations. EBs can thus offer significant physiological benefits that are comparable to those obtained from WMs in the early phase of strength training of sedentary middle-aged women.

Mahalingam and Vairamani (2015) in their extensive investigation had indicated the advantageous effect of physical activity on physical fitness and activities of daily living in older adults, but none have delve into the effects on the health of the women who had all along their life been helping everyone to enjoy life. This exploration studied the effect of an exercise program on Body Mass Index, Flexibility and Agility in women of age ranging from 40 to 50 years. Ninety (mean age 42.5 ± 5.5 years) women were randomly assigned to two treatment groups (n = 30) and a control group (n = 30) group and were evaluated before and after training. The treatment group completed an 8-week walking and guided yoga programs. Assessments included body weight and height, Boomerang Run Test (Right) for measuring agility and Sit and Reach Test for measuring Agility. ANCOVA revealed significant differences between groups (p & lt; .001) for all measurements. Post-hoc test revealed that walking program had a higher effect in all the three fitness measures than yogic program.

Arun (2015) assessed the effect of aerobic exercises and yogic asanas on flexibility of students (boys) in the age group of to 14 to 16 years. To achieve the purpose of the study 60 boys studying in Kendriya Vidyalaya High School of Pune District were selected at random as subjects of the study and divided into three groups of 20 subjects each; all of them were taking part in routine physical education programme as per the schedule of the college. Group A and Group B are the experimental groups and group C served as control group. Group 'A' practiced in the selected yogasanas and Group B practiced the selected aerobic exercises and Group C didn't participate in any exercises. To measure the shoulder flexibility and trunk flexibility Goniometer and Leighton flexometer were used to collect the data. The data was statically analyzed using mean difference method (t -ratio) and ANCOVA. Aerobic exercise and yogic asana training programme are effective in improving flexibility of the shoulder and trunk. Yogic asana training programme is found to be more effective as compared to the aerobic exercise programme in developing the flexibility. No significant improvement in the case of control group may be a reflection of inactivity.

Mahalingam and Vairamani (2015) observed in their study stated that the school boys wre under the influence of Television, computer games and junk food and are not interested in any type of physical activity. Even during the games periods, they stayed under the shades of

trees and just chat and play games through their mobile apps. It was a very dangerous situation that requires immediate attention. Before defining any program, the author tested the levels of agility and Flexibility of 60 school boys of 9^{th} standard (Age 15 years) in a Chennai city school. Since agility was considered as an important movement skill necessary for successful participation in any kind of games that demanded rapid change of direction and flexibility was needed to perform everyday activities with relative ease. It was astonishing to note that their levels of agility and flexibility were comparatively very low to their age and hence the scholar devised an aerobic exercise program and Suryanamaskar routine. He divided the 60 boys into three groups as Experimental Group - I, Experimental Group – II and administered aerobic exercise program for Experimental Group I and conducted the suryanamaskar for Experimental Group – II, 6 weeks, five days in a week. The control group did not have any physical activity. After the experimental period of 6 weeks, the measurements on Agility and Flexibility were taken and the results were analyzed through the application of ANCOVA. It was found that the Experimental group I and Experimental Group-II had shown significant improvement in their levels of Agility and Flexibility and the Experimental Group – II which performed the Suryanamaskar Program showed better levels of improvement over the Experimental Group – I which performed the Aerobic Exercises. It was concluded that the passive Suryanamaskar if performed 12 times daily with breathing control as described, would definitely improve the general fitness and specifically the Agility and Flexibility. It was recommended that Yoga teachers might be appointed in schools and they teach Suryanamaskar along with their regular yoga program which will go a long way in maintaining the general fitness of school boys.

2.2 Studies on yoga and physiological variables

Globally, the prevalence of chronic, non-communicable diseases is increasing at an alarming rate. About 18 million people die every year from cardiovascular disease, for which diabetes and hypertension are major predisposing factors. Propelling the upsurge in cases of diabetes and hypertension is the growing prevalence of overweight and obesity — which have, during the past decade, joined underweight, malnutrition, and infectious diseases as major health problems threatening the developing world.1 Today, more than 1.1 billion adults worldwide are overweight, and 312 million of them are obese. In addition, at least 155 million

children worldwide are overweight or obese, according to the International Obesity Task Force. This task force and the World Health Organization (WHO) have revised the definition of obesity to adjust for ethnic differences, and this broader definition may reflect an even higher prevalence — with 1.7 billion people classified as overweight worldwide. (Hossain, Kawar and El Nahas, 2007).

McCaffrey et al. 2005 studied to determine the effectiveness of a yoga program on blood pressure and stress, a group of hypertensive patients in Thailand were studied, with the experimental group showing significantly decreased mean stress scores and blood pressure, heart rate, and body mass index levels compared with the control group. Further studies were suggested to determine the effects of yoga on hypertension in Thailand.

Hegde et al. 2011 assessed the effect of yoga on anthropometry, blood pressure, glycemic control, and oxidative stress in type 2 diabetic patients on standard care in comparison with standard care alone. Their study involved 123 patients stratified according to groups with micro-vascular complications, macro-vascular complications, and peripheral neuropathy and without complications and assigned to receive either standard care or standard care along with additional yoga for 3 months. In comparison with standard care alone, yoga resulted in significant reduction in BMI, glycemic control, and malondialdehyde and increase in glutathione and vitamin C. There were no differences in waist circumference, waist-to-hip ratio, blood pressure, vitamin E, or superoxide dismutase in the yoga group at follow-up. They concluded that **y**oga could be used as an effective therapy in reducing oxidative stress in type-2 diabetes. Yoga in addition to standard care helps reduce BMI and improve glycemic control in type 2 diabetic patients.

Some developing countries face the paradox of families in which the children are underweight and the adults are overweight. This combination has been attributed by some people to intrauterine growth retardation and resulting low birth weight, which apparently confer a predisposition to obesity later in life through the acquisition of a “thrifty” phenotype that, when accompanied by rapid childhood weight gain, is conducive to the development of insulin resistance and the metabolic syndrome. (Hossain, Kawar and El Nahas, 2007)

Mondal, Balakrishnan and Krishnamurthy (2015) found yoga as an ancient Indian system of life, encompassing various practices including practices for self discipline and also for regulating the health states of the individual, being practiced for thousands of years. In their present study they aimed at understanding the effect of two high frequency breathing practices over autonomic nervous system. Forty healthy male volunteers of age 21 ± 2 years with 9 ± 3 months of Yoga practice experience were recruited. The two high frequency Yoga breathing practices, kapalabhati (KB) and bhastrika (BH) were given as interventions randomly on either of the two days to minimize laboratory bias. They were assessed before and immediately after the interventions for heart rate, respiratory rate, heart rate variability (HRV), blood pressure and peripheral oxygen saturation. There was a significant increase in heart rate ($p < 0.01$; $p < 0.001$), systolic blood pressure ($p < 0.01$; $p < 0.001$), NN50 ($p < 0.01$; $p < 0.001$) component of HRV for both KB and BH groups respectively. There was a significant reduction in respiratory rate in both the groups ($p < 0.001$, and $p < 0.05$, BH and KB respectively) immediately following intervention. A significant increase in LF component of HRV and reduction in Diastolic blood pressure and high frequency (HF) component following KB was also observed ($p < 0.05$, for all comparisons). The Mean peripheral oxygen saturation remained unaltered in both the groups ($p > 0.05$). The results suggest that high frequency yoga breathing practices induce physiological arousal immediately as evidenced by increased blood pressure and heart rate. The sympathetic arousal was more following KB session as evidenced by an increased diastolic blood pressure, LF power and a decrease in HF power of HRV as compared to the BH session.

Stacey et al. (2015) aimed to assess middle-aged women's needs when making body weight management decisions and to evaluate a knowledge translation tool for addressing their needs. A mixed-methods study used an interview-guided theory-based survey of professional women aged 40 to 65 years. The tool summarized evidence to address their needs and enabled women to monitor actions taken. Acceptability and usability were reported descriptively. Sixty female participants had a mean body mass index of 28.0 kg/m^2 (range, 17.0-44.9 kg/m^2), and half were premenopausal. Common options for losing (82%) or maintaining (18%) weight included increasing physical activity (60%), eating healthier (57%), and getting support (40%). Decision-making involved getting information on options (52%), soliciting others'

decisions/advice (20%), and being self-motivated (20%). Preferred information sources included written information (97%), counseling (90%), and social networking websites (43%). Five professionals (dietitian, personal trainer, occupational therapist, and two physicians) had similar responses. Of 53 women sent the tool, 27 provided acceptability feedback. They rated it as good to excellent for information on menopause (96%), body weight changes (85%), and managing body weight (85%). Most would tell others about it (81%). After 4 weeks of use, 25 women reported that the wording made sense (96%) and that the tool had clear instructions (92%) and was easy to use across time (88%). The amount of information was rated as just right (64%), but the tool had limited space for responding (72%). When making decisions about body weight management, women's needs were "getting information" and "getting support." The knowledge translation tool was acceptable and usable, but further evaluation is required.

Mishra, Pandey and Dubey (2015) purposed their study was to find out the effect of yogic training on selected physiological variables. For the present study twenty five male students of 9th and 10th standard from Children Senior Secondary School, Azamgarh, Uttar Pradesh were selected randomly as the subjects for the study. The age of the subjects were ranging from 13 - 16 years. Selection of Variable: The variables selected for the present study were yogic training (independent variable), resting heart rate and vital capacity (dependent variables). The data was collected through the pre and post test. For the study single group design was used in which the pre test was taken prior to the yogic training and post test was taken after eight weeks of yogic training. For comparing pre and post test means of resting heart rate and vital capacity, descriptive analysis and paired t-test were applied at 0.05 level of significant. Result: The result of the study showed that there was significant difference between pre and post test of resting heart rate and vital capacity. Conclusion: On the basis of the findings it was concluded that the yogic training may be responsible for the improvement of selected physiological variables like resting heart rate and vital capacity.

2.3 Studies on yoga and biochemical variables

Kwon et al. (2007) had explained that levels of obesity-linked non–insulin-dependent diabetes mellitus (NIDDM) and hypertension are highest among indigenous communities in

North America. This is linked to changes in dietary pattern towards high calorie foods such as sugar, refined grain flour, and sweetened beverages. Therefore, a return to traditional dietary patterns may help to reduce these disease problems because of better balance of calories and beneficial nutrients. Further protective non-nutrient phenolic phytochemical against NIDDM and hypertension are potentially high in these foods but less understood. In this study anti-diabetic- and anti-hypertension-relevant potentials of phenolic photochemical were confirmed in select important traditional plant foods of indigenous communities such as pumpkin, beans, and maize using *in vitro* enzyme assays for -glucosidase, α-amylase, and angiotensin I-converting enzyme (ACE) inhibitory activities. *In vitro* inhibitory activities of these enzymes provide a strong biochemical rationale for further *in vivo* studies and dietary management strategy for NIDDM through the control of glucose absorption and reduction of associated hypertension. These enzyme inhibitory activities were further compared to total soluble phenolic content and antioxidant activity of the above-targeted plant foods. Pumpkin showed the best overall potential. Among the varieties of pumpkin extracts P5 (round orange) and P6 (spotted orange green) had high content of total phenolics and moderate antioxidant activity coupled to moderate to high α-glucosidase and ACE inhibitory activities. Therefore this phenolic antioxidant-enriched dietary strategy using specific traditional plant food combinations could generate a whole food profile that had the potential to reduce hyperglycemia-induced pathogenesis and also associated complications linked to cellular oxidation stress and hypertension.

Changes in lifestyle that lead to weight loss reduce the incidence of diabetes and hypertension. But preventing obesity, diabetes, and hypertension will require fundamental social and political changes. Public health initiatives will be required to make affordable, healthful foods available, and initiatives in education and community planning will be needed to encourage and facilitate exercise. (Hossain, Kawar and El Nahas, 2007)

Saha (2015) examined the impact of 12 weeks of yogic intervention on lipid profile in elder women with type 2 diabetes mellitus. In this study, 20 women with type 2 diabetes and between 50 to 70 years old were recruited from two old age home and randomly divided into two (n= 10) groups of experimental and control. Experimental group were subjected to regular

yoga practice for 12 weeks (3 sessions per week, 45 minutes per session), while the control group did not have any regular activity. The dependent variables were total cholesterol, triglycerides, low density lipoprotein, very low density lipoprotein and high density lipoprotein and were examined before and after 12 weeks of yogic intervention in both groups. Results indicated a significant ($p \leq 0.05$) decrease in total cholesterol, triglycerides, low density lipoprotein and very low density lipoprotein; with a significant ($p \leq 0.05$) increase in high density lipoprotein level from its initial value; while showing insignificant result in active control group. Consequently, it is suggested that yoga may be used as an adjunct to reduce type 2 diabetes mellitus of elder women.

Brown and Chevalier (2015) examined the effect of just one hour of grounding on blood viscosity while subjects participated in gentle yoga exercises designed to initiate minor inflammation. In this double blind model, twenty-eight (28) subjects met at the Bowerman Sports Medicine Clinic on the campus of the University of Oregon and were grounded to the earth via contact with a grounded yoga mat or were sham-grounded. Ten yoga exercises were repeated five times over a one-hour period. Blood was taken pre and post exercise and analyzed for blood viscosity using a scanning capillary viscometer. Results: Subjects connected to the earth significantly reduced their post exercise systolic blood viscosity ($p = 0.03$) and diastolic blood viscosity ($p = 0.03$). Conclusion: Grounding has the ability to affect exercise induced inflammation, thereby reducing blood viscosity.

Chaturvedi et al. (2015) observed that alteration in biochemical profile has been observed in premenopausal due to change in the hormonal level. Regular practice of yoga had been found to be effective in improving serum lipid concentration, glycemic index and combat the oxidative stress. The purpose of this study was to analyze the effects of yoga on glycemic index, serum lipid profile, thyroid stimulating hormone (TSH), cortisol and antioxidant activity (AOA) in healthy premenopausal women residing in the coastal region of Karnataka. 111 women aged 40 to 60 years with premenopausal symptoms were recruited considering inclusion and exclusion criteria set for the study. Their participants were checked for glycemic index, serum lipid profile, TSH, cortisol and AOA levels before and after 12-weeks of yoga intervention. Yoga therapy intervention resulted in significant decrease (P=0.05) in fasting blood sugar, glycated hemoglobin (P=0.03), total cholesterol (TC) (P=0.06), low density

lipoprotein (LDL) (*P*=0.04), TC/HDL ratio (*P*=0.002). Serum triglyceride concentration is decreased whereas high density lipoprotein (HDL), TSH and AOA was increased within the normal range after the intervention, though the change was not statistically significant. Cortisol showed no significant change after yoga therapy intervention. They concluded that their findings indicated that yoga helped in improving the glycemic index, serum lipid profile, TSH and AOA in premenopausal women. Thus it could be effectively used to improve the quality of life in premenopausal women.

Goyal et al. (2010) declared that obesity and overweight had become a worldwide epidemic, and there was an urgent need to examine childhood obesity and overweight across countries using a standardized international standard. In the present study they had investigated the prevalence of obesity and overweight and their association with socioeconomic status (SES) and the risk factors like diet, physical activity like exercise, sports, sleeping habit in afternoon, eating habits like junk food, chocolate, eating outside at weekend, family history of diabetes and obesity. The study was carried out in 5664 school children of 12-18 years of age and having different SES. The obesity and overweight were considered using an updated body mass index reference. SES and life style factors were determined using pre-tested questionnaire. It was concluded that age-adjusted prevalence of overweight was found to be 14.3% among boys and 9.2% among girls where as the prevalence of obesity was 2.9% in boys and 1.5% in girls. The prevalence of overweight among children was higher in middle SES as compared to high SES group in both boys and girls whereas the prevalence of obesity was higher in high SES group as compared to middle SES group. The prevalence of obesity as well as overweight in low SES group was the lowest as compared to other group. Eating habit like junk food, chocolate, eating outside at weekend and physical activity like exercise, sports, sleeping habit in afternoon having remarkable effect on prevalence on overweight and obesity among middle to high SES group. Family history of diabetes and obesity were also found to be positively associated. Their data suggested that the prevalence of overweight and obesity varied remarkably with different socioeconomic development levels.

Ramachandran et al. (2002) found that the prevalence of diabetes mellitus (DM) and cardiovascular disease (CVD) was increasing in urban India. Overweight in adolescence was a marker of overweight in adult age, and it showed an association with the above diseases. There had been meager data from India on the prevalence of childhood obesity. The objective of the study was to quantify the prevalence of overweight and its risk factors in adolescent children in urban India. School students in the age group of 13–18 years (*n*=4700, M:F 2382:2318) were studied. Body mass index (BMI) was measured. Data on physical activity, food habits, occupation of parents and their economic status, birth weight of the children and age at menarche in girls were obtained by questionnaire. Age-adjusted prevalence of overweight was 17.8% for boys and 15.8% for girls. It increased with age and was higher in lower tertiles of physical activity and in higher socio-economic group. Birth weight and current BMI were positively associated. The study highlighted the high prevalence of overweight in adolescent children in urban India. Life style factors influenced BMI in adolescent age.

Heitmann et al. (2015) assessed the influence of gender and age on the associations between different measures of obesity, and blood lipid levels. Overall obesity (body fat, body fat percentage and body mass index) or abdominal obesity (waist/hip-ratio, waist/thigh-ratio and waist-circumference) and lipid levels [high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL), total cholesterol and triglyceride level] were measured in 1987/88 in a random Danish population sample of men and women (*N* = 2987), aged 35, 45, 55 and 65 yr. All lipid levels were dependent on gender and age. The associations between most measures of obesity and HDL or LDL were independent of gender and age, whereas, with a few exceptions, associations between measures of obesity and total cholesterol, VLDL or triglycerides were dependent on gender and/or age. Compared to levels of HDL, LDL and total cholesterol, abdominal obesity specifically affected levels of VLDL or triglycerides, whereas overall obesity affected HDL, LDL, VLDL, total cholesterol and triglyceride levels more evenly. When men and women were compared, associations between the measures of obesity and blood lipids were stronger in men than in women of the same age, except for the associations between measures of abdominal obesity and VLDL or triglycerides in 45-year-old women. No age trend was found for associations between the measures of

obesity and VLDL or triglycerides, whereas young age-groups showed stronger associations between obesity and total cholesterol than older age-groups. Failure to consider age/gender effects induces bias and may lead to misleading conclusions regarding the bivariate association between obesity and lipids, and further may make results from population studies incomparable.

Rhéaume et al. (2015) had an objective of their study to determine the respective contributions of waist circumference and systemic hypertension (HTN) to coronary heart disease (CHD) risk in a large population-based cohort representative of a contemporary European population. A total of 9580 men and 12250 women aged 45–79 years were followed for 11.4 years. Over the follow-up, 2191 CHD events were recorded. Our results show that abdominal obesity (measured by waist circumference) and HTN had both independent and additive contributions to CHD risk. They also found that physical inactivity and abdominal obesity contribute to elevated BP in primary prevention settings.

Zmijewski et al. (2015) aimed to study and determine health benefits among women older than 55 years who participated in organized, group-based physical activity (OPA). Thirty-five women aged 65.0 ± 7.3 years volunteered for this study. The classical and nonclassical cardiovascular (CVD) risk factors were measured before and after a 2-week OPA camp in a remote location and 3 months of OPA. Self-guided physical activity was analyzed 18 months after OPA. Two-week effects included significant decreases in body mass index, waist and hip circumferences, resting systolic and diastolic blood pressure (BP) and resting heart rate, improved exercise capacity (EC), improved low-density lipoprotein and high-density lipoprotein (HDL-C), cholesterol, and other atherogenic lipid indices (ALI), and a reduction in 10-year estimated risk of death from CVD. Three-month effects included a further decrease in systolic BP, improvements in EC and HDL-C, and maintenance of lower levels of ALI, as well as lower CVD risk. The implementation of the OPA programme had a positive impact on somatic features, exercise capacity, biochemical indices, and risk for death from CVD. The presented programme can be regarded as an effective element of primary prevention of cardiovascular diseases among women older than 55 years.

Dabrowska et al. (2015) found that obesity was one of the most common nutrition-related disorders worldwide and one of the major health problems in menopausal women, which significantly worsens the quality of life and can lead to severe diseases or even premature death. The aim of the study was to evaluate the relation between physical activity in different domains undertaken by menopausal women while performing daily activities and their body mass index (BMI). The study was conducted on a random sample of 400 healthy Polish women aged 45-55. The questionnaire contained questions concerning the respondents' socio-economic status, medical history and the long format of the International Physical Activity Questionnaire was used. Fifty-one percent (50.6%) of women had normal body mass, 43.75% of respondents were overweighed and 5.65% of women were obese. A moderate physical activity level was presented by most midlife women in domestic and garden domain, active transportation and leisure time. Pearson's correlation showed that such factors as age, education and physical activity level in different domains have a significant correlation with BMI. Conclusions: Most respondents presented a moderate physical activity level in all domains except work, where the respondents had a high physical activity (PA) level. A high PA level especially at work ($r = –0.5788$) and during leisure time ($r = –0.5175$) strongly correlate with lower BMI.

2.4 Studies on yoga and diet regulations

Trent & Conway,(1988), examined the relationship between habitual dietary practices and performance on the physical readiness test required of active duty Navy personnel. Participants were 1,013 men (mean age = 26.2 years) stationed aboard nine Navy ships. The men completed a self-report survey of lifestyle and dietary habits and were evaluated on four tests of physical fitness: 1.5-mile Run, Sit-ups, Sit-reach, and Percent Body Fat. A standardized Overall Fitness score was also computed for each person. Results indicated that the participants tended to skip breakfast, ingest moderate amounts of caffeine, and favor a high-fat, low-fiber diet. Fitness scores were associated with a number of dietary variables, including caffeine intake, between-meal snacking, and overeating (all negatively related to fitness, $p < .01$), and having a general "nutrition orientation" (positively related to fitness, $p < .001$). The relationships were confounded by the influence of age, exercise, and

smoking, but even after controlling for these, diet was a significant predictor of fitness (p <.001).

Djoussé and Gaziano (2008) declared that reduction in dietary cholesterol was recommended to prevent cardiovascular disease (CVD). Although eggs are important sources of cholesterol and other nutrients, limited and inconsistent data are available on the effects of egg consumption on the risk of CVD and mortality. We aimed to examine the association between egg consumption and the risk of CVD and mortality. In a prospective cohort study of 21 327 participants from Physicians' Health Study I, egg consumption was assessed with an abbreviated food questionnaire. Cox regression was used to estimate relative risks. In an average follow-up of 20 y, 1550 new myocardial infarctions (MIs), 1342 incident strokes, and 5169 deaths occurred. Egg consumption was not associated with incident MI or stroke in a multivariate Cox regression. In contrast, adjusted hazard ratios (95% CI) for mortality were 1.0 (reference), 0.94 (0.87, 1.02), 1.03 (0.95, 1.11), 1.05 (0.93, 1.19), and 1.23 (1.11, 1.36) for the consumption of <1, 1, 2–4, 5–6, and ≥7 eggs/wk, respectively (P for trend < 0.0001). This association was stronger among diabetic subjects, in whom the risk of death in a comparison of the highest with the lowest category of egg consumption was twofold (hazard ratio: 2.01; 95% CI: 1.26, 3.20; P for interaction = 0.09). Infrequent egg consumption does not seem to influence the risk of CVD in male physicians. In addition, egg consumption was positively related to mortality, more strongly so in diabetic subjects, in the study population.

Misra et al. (2011) expressed that India had been undergoing rapid nutritional transition, resulting in excess consumption of calories, saturated fats, *trans*fatty acids, simple sugars, salt and low intake of fiber. Such dietary transition and a sedentary lifestyle had led to an increase in obesity and diet-related non-communicable diseases (type 2 diabetes mellitus [T2DM], cardiovascular disease [CVD], etc.) predominantly in urban, but also in rural areas. In comparison with the previous guidelines, these consensus dietary guidelines include reduction in the intake of carbohydrates, preferential intake of complex carbohydrates and low glycemic index foods, higher intake of fiber, lower intake of saturated fats, optimal ratio of essential fatty acids, reduction in trans fatty acids, slightly higher protein intake, lower intake of salt, and restricted intake of sugar. While these guidelines are applicable to Asian Indians in any geographical setting, they are particularly applicable to those residing in urban and in semi-

urban areas. Proper application of these guidelines will help curb the rising "epidemics" of obesity, the metabolic syndrome, hypertension, T2DM, and CVD in Asian Indian.

Dixit (2011) spoke out that refined carbohydrates, such as white rice and white flour, are the mainstay of the modern Asian Indian diet, and may contribute to the rising incidence of type 2 diabetes and cardiovascular disease in this population. Prior to the 1950s, whole grains such as amaranth, barley, brown rice, millet, and sorghum were more commonly used in Asian Indian cooking. These grains and other non-Indian grains such as couscous, quinoa, and spelt are nutritionally advantageous and may be culturally acceptable carbohydrate substitutes for Asian Indians. This review focuses on practical recommendations for culturally sensitive carbohydrate modification in a modern Asian Indian diet to reduce type 2 diabetes and cardiovascular disease in this population.

Dutta and Singh (2014) had opined that obesity and overweight had become a worldwide epidemic, and there has been an urgent need to examine childhood obesity and overweight across countries using a standardized international standard. In the present study they had investigated the prevalence of obesity and overweight and their association with socioeconomic status (SES) and the risk factors like diet, physical activity like exercise, sports, sleeping habit in afternoon, eating habits like junk food, chocolate, eating outside at weekend, family history of diabetes and obesity. The study was carried out in 5664 school children of 12-18 years of age and having different SES. The obesity and overweight were considered using an updated body mass index reference. SES and life style factors were determined using pre-tested questionnaire. Age-adjusted prevalence of overweight was found to be 14.3% among boys and 9.2% among girls where as the prevalence of obesity was 2.9% in boys and 1.5% in girls. The prevalence of overweight among children was higher in middle SES as compared to high SES group in both boys and girls whereas the prevalence of obesity was higher in high SES group as compared to middle SES group. The prevalence of obesity as well as overweight in low SES group was the lowest as compared to other group. Eating habit like junk food, chocolate, eating outside at weekend and physical activity like exercise, sports, sleeping habit in afternoon having remarkable effect on prevalence on overweight and obesity among middle to high SES group. Family history

of diabetes and obesity were also found to be positively associated. Our data suggest that the prevalence of overweight and obesity varies remarkably with different socioeconomic development levels.

Brown, et al. (2015) had through their systematic review and meta-analysis was assessed the effectiveness of diet and physical activity interventions to prevent or treat obesity in South Asians living in or outside of South Asia and to describe the characteristics of effective interventions. Systematic review of any type of lifestyle intervention, of any length of follow-up that reported any anthropometric measure for children or adults of South Asian ethnicity would benefit to all. There was no restriction on the type of comparator; randomised controlled trials, controlled clinical trials, and before-after studies were included. A comprehensive search strategy was implemented in five electronic databases: ASSIA, Cochrane Controlled Trials Register, Embase, Medline and Social Sciences Citation Index. The search was limited to English language abstracts published between January 2006 and January 2014. References were screened; data extraction and quality assessment were carried out by two reviewers. Results are presented in narrative synthesis and meta-analysis. Twenty-nine studies were included, seven children, 21 adult and one mixed age. No studies in children under six were identified. Sixteen studies were conducted in South Asia, ten in Europe and three in USA. Effective or promising trials include physical activity interventions in South Asian men in Norway and South Asian school-children in the UK. A home-based, family-orientated diet and physical activity intervention improved obesity outcomes in South Asian adults in the UK, when adjusted for baseline differences. Meta-analyses of interventions in children showed no significant difference between intervention and control for body mass index or waist circumference. Meta-analyses of adult interventions showed significant improvement in weight in data from two trials adjusted for baseline differences (mean difference −1.82 kgs, 95% confidence interval −2.48 to −1.16) and in unadjusted data from three trials following sensitivity analysis (mean difference −1.20 kgs, 95% confidence interval −2.23 to −0.17). Meta-analyses showed no significant differences in body mass index and waist circumference for adults. Twenty of 24 intervention groups showed improvements in adult body mass index from baseline to follow-up; average change in high quality studies (n = 7) ranged from 0.31 to −0.8 kg/m2. There was no evidence that interventions were more or

less effective according to whether the intervention was set in South Asia or not, or by socio-economic status. Meta-analysis of a limited number of controlled trials found an unclear picture of the effects of interventions on body mass index for South Asian children. Meta-analyses of a limited number of controlled trials showed significant improvement in weight for adults but no significant differences in body mass index and waist circumference. One high quality study in South Asian children found that a school-based physical activity intervention that was delivered within the normal school day which was culturally sensitive, was effective. There was also evidence of culturally appropriate approaches to, and characteristics of, effective interventions in adults which we believe could be transferred and used to develop effective interventions in children.

Kehoe et al. (2015) suggested that intakes of micronutrient-rich foods were low among Indian women of reproductive age. They investigated whether consumption of a food-based micronutrient-rich snack increased markers of blood micronutrient concentrations when compared with a control snack. Non-pregnant women (*n* 222) aged 14–35 years living in a Mumbai slum were randomised to receive a treatment snack (containing green leafy vegetables, dried fruit and whole milk powder), or a control snack containing foods of low micronutrient content such as wheat flour, potato and tapioca. The snacks were consumed under observation 6 d per week for 12 weeks, compliance was recorded, and blood was collected at 0 and 12 weeks. Food-frequency data were collected at both time points. Compliance (defined as the proportion of women who consumed ≥ 3 snacks/week) was >85 % in both groups. We assessed the effects of group allocation on 12-week nutrient concentrations using ANCOVA models with respective 0-week concentrations, BMI, compliance, standard of living, fruit and green leafy vegetable consumption and use of synthetic nutrients as covariates. The treatment snack significantly increased β-carotene concentrations (treatment effect: 47·1 nmol/l, 95 % CI 6·5, 87·7). There was no effect of group allocation on concentrations of ferritin, retinol, ascorbate, folate or vitamin B_{12}. The present study showed that locally sourced foods can be made into acceptable snacks that may increase serum β-carotene concentrations among women of reproductive age. However, no increase in circulating concentrations of the other nutrients measured was observed.

Kumar Trivedi and Dixit (2015) found that diabetes was an important human ailment afflicting many from various walks of life in different countries. They observed that in recent years, diabetes had become a major health problem worldwide, affecting people across all ages, sex, ethnicities, and races, and its prevalence had been increasing at an alarming rate. Currently, pharmacologic agents available to treat diabetes carry high costs and serious side effects. In contrast, natural products used in the conventional Indian medicinal system have been applied effectively in clinical practice and may be potential targets in the development of future cost effective anti-diabetic drugs with less side effects. In the modern era, various medicines had been developed for hyperglycemic, but nearly all are chemical or biochemical agents. A list of medicinal plants with proven anti-diabetic and related beneficial effects and of herbal drugs used in treatment of diabetes had been compiled. There was a need to create awareness regarding the evidence for and use of herbal medicines in the management and treatment of diabetes. The wealth of tribal knowledge on medicinal plants points to a great potential for research and the discovery of new drugs to fight diseases including diabetes, obtaining new foods and other new uses. The purpose of this review was to examine medicinal plants that may be promising alternative treatments in the management and treatment of diabetes, especially in India.

Ramos-Jiménez et al. (2015) found that Yoga was an ancient oriental discipline that emerged from mystical and philosophical concepts. Today it had been practiced in the west, partly due to the promotion of its benefits to improve the lifestyle and overall health. As compared to non-*Hatha Yoga* (HY) practitioners, healthier and better-eating patterns had been observed in those who practice it. Agreement with the brought benefits, *HY* could be used as a therapeutic method to correct abnormal eating behaviors (AEB), obesity, and some metabolic diseases. However, the energy expenditure during traditional protocols of *HY* was not high; hence, it was not very effective for reducing or maintaining body weight or to improve cardiovascular conditioning. Even so, several observational studies suggested significant changes in eating behaviors, like a reduction in dietary fat intake and increments in that of fresh vegetables, whole grains and soy-based products, which in turn might reduce the risk for cardiovascular diseases. Given the inconsistency of the results derived from cross-sectional

studies, more case-control studies were needed to demonstrate the efficacy of *HY* as an alternative method in the clinical treatment of disordered eating and metabolic diseases.

Kajale et al. (2015) sought to develop an understanding of how employed mothers constructed time for food provisioning for themselves and their families. Thirty-five low-wage employed mothers were purposively recruited to vary in occupation, race/ethnicity, education, household composition, and age using workplace, community, convenience, and snowball sampling. Most mothers expressed feelings of time scarcity. Mothers described 3 time styles that reflected how they constructed time. Time styles reflected mothers' experiences of strain and time scarcity, usual time management strategies, and sense of control over time. Mothers prioritized feeding their children but wanted to complete meals quickly in order to move on to other tasks. Recognizing issues of time scarcity and individual differences of time styles and time management strategies can help researchers better understand food choice practices and assist practitioners in identifying practical food provisioning strategies for low-wage employed mothers. Food policies and recommendations should be evaluated for their relevance to the time scarcity and work strain issues that these mothers faced.

2.5 Studies on Indian medicines

2.5.1 Indian Gooseberry

Khanna (2015) with an objective to determine the effect of oral supplementation of a standardized extract of *Phyllanthus emblica* on cardiovascular disease (CVD) risk factors in overweight adult human subjects from the US population. Overweight/Class-1 obese (body–mass index: 25–35) adult subjects received 500mg of CAPROS supplement b.i.d for 12 weeks. The study design included two baseline visits followed by 12 weeks of supplementation and then 2 weeks of washout. At all visits, peripheral venous blood was collected in sodium citrate tubes. Lipid profile measurements demonstrated a significant decrease in calculated low-density lipoprotein cholesterol and total cholesterol/high-density lipoprotein following 12 weeks of CAPROS supplementation when compared to averaged baseline visits. Circulatory high-sensitivity C reactive protein (hs-CRP) levels were significantly decreased after 12 weeks of supplementation. In addition, both ADP- and collagen-induced platelet aggregations were significantly down regulated following 12 weeks of supplementation. Overall, the study

suggests that oral CAPROS supplementation may provide beneficial effects in overweight/Class-1 obese adults by lowering multiple global CVD risk factors.

Emblica officinalis is a natural, efficacious, an antioxidant with the richest natural source of Vitamin C. Emblica officinalis berries have the highest amount of naturally occurring vitamin C of any ripe fruit in the world used as a traditional food. Numerous studies conducted on Emblica officinalis fruit suggest that it has anti-viral properties and also functions as an anti-bacterial and anti-fungal agent. The gelatinous plum-sized Amla fruit contains naturally occurring vitamin, heat stable vitamin C. A clinical study on patients with pulmonary tuberculosis showed that the vitamin C contained in Emblica officinalis was better assimilated than synthetic vitamin C. Further research of contemporary and traditional medical literature indicates that Emblica officinalis either in combination with other herbs or alone has been useful in the amelioration of colds, warts, skin afflictions, influenza, anemia, diabetes, lung conditions, elevated cholesterol and as an immune restorative in cancer conditions. It is one of the best natural antiageing remedies Emblica officinalis is used in treatment of Acne and other skin problems. Emblica officinalis is amazingly effective natural anti-ageing product. Emblica officinalis is very effective in treatment of Acidity and Peptic ulcers. Emblica officinalis is rich in Vitamin C, Calcium, Iron, essential amino acids and many other vitamins and minerals and anti-oxidants. Regular Use of Emblica officinalis improves immunity, fights cancers, rejuvenates the body. It fights chronic diseases like hypertension, high Cholesterol, Diabetes, AIDS, influenza, Chronic cough and cold, Chronic infections, Chronic fatigue and Chronic inflammatory conditions. Ayurveda describes it as one of the best herbs for Diabetes, bleeding disorders, strength and stamina promoter. Keyword: Emblica officinalis, cancers, Vitamin C, Diabetes, Natural anti-ageing. Amla which is known as Emblica officinalis is an Indian herb which is extensively used in ayurvedic system of medicine. Amla is a prestigious herb finds it mention in charak samhita as a rasayan. Rasayan is a thing that prevent aging and promote longevity. Amla was an extensively used herb in making ayurvedic medicines because of its miraculous actions. According to ayurvedic doctors regular usage of Amla will make you live more than 100 years like a youth. Amla is supposed to rejuvenate all the organ systems of the body, provide strength and wellness. It keeps us away from all the diseases by boosting our immune system. It is believed by

ayurvedic practitioners that if an individual regularly takes amla he can live up to an age of 100 without suffering from any type of ailments. In this article let us find out more about this magical herb and see where we can imply it in our own life. Fresh fruit is refrigerant, diuretic and laxative. Fruit is also carminative and stomachic. Dried fruit is sour and astringent. Bark is astringent. The herb is also aphrodisiac, haemostatic, nutritive tonic and rejuvenative. It increases red blood cell count. Amalaki is one of the highest natural source of Vitamin C (3,000 mg per fruit). Amla fruit paste is main ingredient of Chyawanprash, a popular Ayurvedic tonic. Amla is known as amritphale in Sanskrit, which literally means the fruit of heaven or nectar fruit. It is so called because it is rich in many desirable properties. It was described in a 7th century Ayurvedic medical text. According to several scholars, the sage Chyawan is reputed to have restored his vitality with this fruit. Researches of modern times have proved that Regular use of Amla enhances production of Red Blood Cells, strengthens teeth, hair and nails. Regulates Blood Sugar and lipids in cell membranes has anti-inflammatory effect. It is found to be useful in hemorrhoids, gastritis and colitis. It is also proved to be effective in eye problems especially in inflammations, Improves sight and is useful for cataracts. Prevents premature graying of hair and makes them strong and free from dandruff. Improves immunity and protects heart, brain and other vital organs of body. Amla which is known as Emblica officinalis is an Indian herb which is extensively used in ayurvedic system of medicine. It is believed by ayurvedic practitioners that if an individual regularly takes amla he can live up to an age of 100 without suffering from any type of ailments. In this article let us find out more about this magical herb and see where we can imply it in our own life. Amla which is known as Emblica officinalis is an Indian herb which is extensively used in ayurvedic system of medicine. It is believed by ayurvedic practitioners that if an individual regularly takes amla he can live up to an age of 100 without suffering from any type of ailments. In this article let us find out more about this magical herb and see where we can imply it in our own life. The fruit is the richest source of Vitamin C and is a diuretic, aperient, Laxative and hair dye. It cures insomnia and is healthy for hair. It is used as the cardio protective, useful in hemorrhage, menorrhagia, leucorrhoea and discharge of blood from uterus. Amla power and oil are used traditionally in Ayurvedic applications for the treatment of scalp. Amla power improves immunity and gives physical strength. It improves complexion and removes wrinkles. Amla is also used to treat constipation and is used as a cooling agent to

reduce the effects of sun strokes and sun burns. It is the main ingredient used in the shampoo. Amla oil is used all over world. Amla is used in sauces, candy, dried chips, pickle, jellies and powder. It is even used in the dyeing industry. It extract is popularly used in the ink. Amla wood is commonly used in firework. (Kumar et al. 2012).

2.5.2. Ginger

Ghasemzadeh (2010) explained Ginger (*Zingiber officinale* Roscoe) as a well known and widely used herb, especially in Asia, which contains several interesting bioactive constituents and possesses health promoting properties. In this study, the antioxidant activities of methanol extracts from the leaves, stems and rhizomes of two *Zingiber officinale* varieties (Halia Bentong and Halia Bara) were assessed in an effort to compare and validate the medicinal potential of the subterranean part of the young ginger. The antioxidant activity and phenolic contents of the leaves as determined by the 1,1-diphenyl-2-picryl-hydrazyl (DPPH) assay and the total amounts of phenolics and flavonoids were higher than those of the rhizomes and stems. On the other hand, the ferric reducing/antioxidant potential (FRAP) activity of the rhizomes was higher than that of the leaves. At low concentration the values of the leaves' inhibition activity in both varieties were significantly higher than or comparable to those of the young rhizomes. Halia Bara had higher antioxidant activities as well as total contents of phenolic and flavonoid in comparison with Halia Bentong. This study validated the medicinal potential of the leaves and young rhizome of *Zingiber officinale* (Halia Bara) and the positive relationship between total phenolics content and antioxidant activities in *Zingiber officinale.*

Shidfar et al. (2015) considered ginger (*Zingiber officinale*) as one of the functional foods which contains biological compounds including gingerol, shogaol, paradol and zingerone. Ginger had been proposed to have anti-cancer, anti-thrombotic, anti-inflammatory, anti-arthritic, hypolipidemic and analgesic properties. In this study they reported the effect of ginger supplementation on glycemic indices in Iranian patients with type 2 diabetes. A double-blind, placebo-controlled, randomized clinical trial was conducted on 20–60 -year-old patients with type 2 diabetes who did not receive insulin. Participants in the intervention and control groups were received 3 g of powdered ginger or placebo (lactose) (in capsules) daily for 3 months. Glycemic indices, total antioxidant capacity (TAC), malondialdehyde (MDA), C-

reactive protein (CRP), serum paraoxonase, dietary intake and physical activity were measured at the beginning and end of the study, and after 12 h fasting. Comparison of the indices after 3 months showed that the differences between the ginger and placebo groups were statistically significant as follows: serum glucose (–19.41±18.83 vs. 1.63±4.28 mg/dL, $p<0.001$), HbA_{1c} percentage (–0.77±0.88 vs. 0.02±0.16 %, $p<0.001$), insulin (–1.46±1.7 vs. 0.09±0.34 μ IU/mL, $p<0.001$), insulin resistance (–16.38±19.2 vs. 0.68±2.7, $p<0.001$), high-sensitive CRP (–2.78±4.07 vs. 0.2±0.77 mg/L, $p<0.001$), paraoxonase-1 (PON-1) (22.04±24.53 vs. 1.71±2.72 U/L, $p<0.006$), TAC (0.78±0.71 vs. –0.04±0.29 μIU/mL, $p<0.01$) and MDA (–0.85±1.08 vs. 0.06±0.08 μmol/L, $p<0.001$) were significantly different. The report showed that the 3 months supplementation of ginger improved glycemic indices, TAC and PON-1 activity in patients with type 2 diabetes.

2.5.2 Garlic

Foushee Ruffin and Banerjee (1981) had their major objective of this study to re-evaluate the effects of garlic on blood pressure with respect to its ability to provoke a decrease in blood pressure and to determine the length of time that this decrease would require. Spontaneously hypertensive rats were given three doses of garlic extract (0.1 ml/kg, 0.25 ml/kg, and 0.5 ml/kg) by oral injection. The blood pressures of these ether-anaesthetizedrats were measured immediately before the extract was given, and then 0.5, 2, 4, 6, and 24 h after the extract was given. A blood pressure measurement was also taken at 48 h after extract administration for the 0.5 ml/kg dose. The Gilson Duograph System was used to measure blood pressure by the tail-cuff method. There was a marked decrease in the systolic blood pressure of all of the rats after three doses and the decrease occurred within 30 min in each case. Even though the average decreases for the 0.1 ml/kg and the 0.25 ml/kg doses were calculated as 51,25 mm Hg and 56.25 mm Hg, respectively, these doses were not sufficient to sustain the blood pressure in a normal range for more than 1 or 2 h. The 0.5 ml/kg dose, showing an average decrease of 65.7 mm Hg, was sufficient to provoke a decrease to a normal level and to sustain this decrease for up to 24 h. The results indicate that garlic is effective as a natural agent for the treatment of hypertension.

Hopkins (2015) High-quality garlic extracts provide an efficacious prescribing option for a range of regularly presenting conditions. As a suitable option for the majority of patients, like with all medicinal herbal extracts, prescribing garlic requires careful consideration in certain subsets of patients, particularly those patients taking pharmaceutical medications, undergoing surgery or those who are pregnant or breastfeeding. Another equally important consideration, which maximises clinical efficacy, is the selection of a consistent highquality standardised garlic extract, with enhanced stability of active constituents.

2.5.3 Mint Leaves

Padmini, Valarmathi & Rani. (2010), observed that Mint (Mentha Spicata) commonly called as spearmint belonged to the family Lamiaceae. This herb was considered as stimulant, carminative, antispasmodic, stomachic and diuretic, and is used in the treatment of gas pain, rheumatism, toothache and muscle pain. Mint possessed antioxidant properties due to the presence of active constituents like menthone, menthol, rosmarinic acid and carvone. Tea was an infusion of flavorful leaves that has been consumed for centuries as a beverage and is valued for its medicinal properties. Tea from the leaves of plant has a wide range of antioxidant, anti-inflammatory and anticarcinogenic activity and presence of catechin and epigallocatechin accounts for the antioxidant property of tea extract.

2.6 Summary of literature

After going through the collected literature, we found that international health agencies and respective government should intensively focus on primordial and primary prevention programs for obesity and the metabolic syndrome in developing countries. Some suggestions like simple progressive exercise training, even in the 10th decade, increased muscle power and was associated with an improved performance of functional activities using the trained muscles.

Older women who participate in an exercise program three times a week gain greater functional fitness benefits than those who exercise less frequently. In order to improve functional fitness in older women, an exercise frequency of at least three times each week should be recommended. In order to improve functional fitness in older women, an exercise

frequency of at least three times each week should be recommended. Also it was not always working women who are under stress; in fact housewives also were stressed in fulfilling family and social expectations.

Hatha yoga could improve anthropometric characteristics, muscular strength and flexibility among volunteers of different age group and could also be helpful in preventing and attenuating age related deterioration of these parameters. Yoga could be used as an effective therapy in reducing oxidative stress in type-2 diabetes. Antioxidant-enriched dietary strategy using specific traditional plant food combinations could generate a whole food profile that had the potential to reduce hyperglycemia-induced pathogenesis and also associated complications linked to cellular oxidation stress and hypertension.

They also found that physical inactivity and abdominal obesity contribute to elevated BP in primary prevention settings. Reduction in dietary cholesterol was recommended to prevent cardiovascular disease (CVD). India had been undergoing rapid nutritional transition, resulting in excess consumption of calories, saturated fats, *trans*fatty acids, simple sugars, salt and low intake of fiber. Such dietary transition and a sedentary lifestyle have led to an increase in obesity and diet-related non-communicable diseases (type 2 diabetes mellitus [T2DM], cardiovascular disease [CVD], etc.) predominantly in urban, but also in rural areas.

Refined carbohydrates, such as white rice and white flour, are the mainstay of the modern Asian Indian diet, and may contribute to the rising incidence of type 2 diabetes and cardiovascular disease in this population. Eating habit like junk food, chocolate, eating outside at weekend and physical activity like exercise, sports, sleeping habit in afternoon having remarkable effect on prevalence on overweight and obesity among middle to high SES group. Family history of diabetes and obesity were also found to be positively associated.

There was also evidence of culturally appropriate approaches to, and characteristics of, effective interventions in adults which we believe could be transferred and used to develop effective interventions in children. Locally sourced foods can be made into acceptable snacks that may increase serum β-carotene concentrations among women of reproductive age. However, no increase in circulating concentrations of the other nutrients measured was

observed. There was a need to create awareness regarding the evidence for and use of herbal medicines in the management and treatment of diabetes. The wealth of tribal knowledge on medicinal plants points to a great potential for research and the discovery of new drugs to fight diseases including diabetes, obtaining new foods and other new uses.

Chapter III

METHODOLOGY

This chapter describes the selection of subjects, selection of variables, selection of tests, tester competency, and reliability of instruments, reliability of data, orientation of the subjects, administration of tests, collection of data, experimental design and statistical technique for analyzing the data.

3.1 Selection of subjects

The present study was to compare the selected motor fitness, physiological and biochemical variables among women of age between 35 and 45 years. To achieve this purpose, 120 female walkers who had not participated in any form of competitive sports from Ambattur town in Chennai city were selected at random for this study. They were selected from among 200 regular walkers in the park to reduce their body weight. After briefing, 120 women volunteers were selected. They were explained about their role in the study and they were requested to extend their best cooperation in making the purpose of the study meaningful and useful to other public at large. They were informed of the purpose of the study and that they had to be in the experiment for a period of 12 weeks and follow the guidelines of the scholar.

3.2 Selection of variables

Important factors that were considered as the real factors that contributed in the gaining of body weight reduced the activity levels and increased the vital signs and those raised blood lipids and blood sugar were selected as the criterion variables. The variables selected were motor fitness variables line agility, hip flexibility and leg power that were important in deciding the mobility of the people who are sedentary, the physiological variables that attributed the accumulation of adipose body fat that make them heavy and restricted their movement and they were indicators of their general health like body mass index, pulse rate

and systolic pulse rate. The biochemical variables that are the outcome of their life styles and the sedentary life style like the LDL, HDL and the blood sugar. They were classified as the criterion variables and independent variables as detailed below and studied with simple tests which needed less training and easy to perform for assessment.

3.3 Dependent Variables

Motor Variables

1. Agility
2. Hip Flexibility
3. Leg explosive power

Physiological Variables

1. Body Mass Index
2. Resting pulse rate
3. Systolic Blood Pressure

Biochemical Variables

1. Low Density Lipoprotein
2. High Density Lipoprotein
3. Random Blood Sugar

3.4 Independent Variables

3.4.1 Yogic Exercise Group

This group consisted of 30 women who performed a set of 6 yogasanas (*yogasanas n.d)* three times daily for 45 minutes for five days in a week under the supervision of the scholar in the school auditorium between 5 and 6 pm. The schedule is given below. They brought their own yoga mattress and after every session the feedback from the participants and they were counseled properly. Each asana was done for 10 to 15 seconds to the ability of individuals. The subjects were instructed not to look at others and do at their own speed and to the extent possible. If they felt any pain, they were advised to stop there. Breathing techniques when performing the asanas were thoroughly explained and they were guided and requested not to pull but to proceed slowly and steadily and attain the pose as much as they can. After the attainment of the asana, they were requested to stay as much as they can and to release slowly

following the breath sequence. All the subjects were doing the asanas with passion and motivation to do better than others and they enjoyed each session. After completing one round of the six asanas, they rested in savasana for 2 minutes and again they repeated the same sequence. Every day for 45 minutes, three rounds were done. They were requested to give their feedback about their convenience or otherwise. The ladies during their periods were told not to participate till they feel convenient.

3.4.1.1 Vajrasana

Fig. 3.1 Vajrasana

Sit down on the floor and assume Sukhasana. Stretch your legs in front. Fold your legs at the knee and bend it backwards along the thighs. Keep your soles turned upwards. Rest your buttocks on the floor between the heels. Join your knees. Stretch your arms and place the palms on the knees. Keep your spine erect and look in front.

3.4.1.2 Sashankasana

Fig. 3.2 Shashankasana

From the last neutral position in Vajrasana, exhale and slowly lower your buttocks on to your heels, with the top of your feet in contact with the floor, and fold your chest down on to your thighs. Initially, keep your arms stretched out in front of you, making your spine as long as comfortably possible, and visualize your breath moving through the base of your spine to the top of your head. Finally, bring your arms close to your legs and surrender completely into this fetal position, giving your entire spine and back a complete rest.

3.4.1.3 Ardha Matsayendrasana

Fig. 3.4 Ardha Matsayendrasana

Bring your left hand behind you and rest it on the floor. Inhale and lift your right arm straight up over your head, stretching the spine upwards. Exhale and turn the body to the left bringing the right arm outside the left knee. Look over the left shoulder. Keep your spine straight and be sure to keep the weight of the body mainly on the spine and not on the left arm. Make sure the shoulders stay parallel to the floor. Try to make this an active posture, twisting the body a little bit more to the left on every exhale. You should feel an equal stretch in every vertebrae of the spine.

3.4.1.4 Bujangasana

Fig.3.4 Bhujangasana

Lie on your belly with your forehead on the ground. Place your hands, palms down, beside your upper ribs. With your toes pointing toward the wall behind you, stretch back through your legs. Keep your legs active and strong. Reach your tailbone toward your heels. With an inhalation, begin to peel your chest away from the ground. Keep your shoulders heavy and your shoulder blades drawing down your back. Gently begin to straighten your arms as your chest lifts and broadens, while maintaining the connection of your pubic bone to the ground. The elbows will remain slightly bent.

3.4.1.5 Paschimottanasana

Fig. 3.5 Paschimottanasana

Sit down straight with your legs together by stretching in front of you. keep your head neck and spine erect. Place the palms on your respective knees. Now bend your head and trunk slowly forward to catch the toes with the thumb, index and middle fingers without bending knees. Take a deep breath and exhale slowly. Try to touch your head to your both knees as shown in above image. Bend the arm and try to touch the elbow on the floor. Exhale completely and holding out your breath stay in this posture for a few seconds. After few seconds slowly return to your starting position. breathe normally.

3.4.1.6 Dhanurasana

Fig. 3.6 Dhanurasana

Lie flat on the floor with the abdomen, chest and chin touching the ground. Keep your hands on both sides. Keep both legs a bit apart. Relax your whole body. Bend your legs backward and grasp the ankles firmly with your hands. First raise your chin and then bend your head and neck backwards. The chest should still be touching the ground. Inhale slowly and pull your legs up. Keep raising your head, neck, chin, chest, thighs and knees backwards, such that only the navel region is touching the ground. Pull your legs and arms arching your body as much as possible. Look up and fix you gaze on the ceiling. Holding your breath maintain this posture until you feel the strain in your back. Start exhaling slowly and gradually return to the starting position.

3.4.2 Diet Regulated Group

The diet regulated group consisted of 30 female subjects, who were asked to follow a regulated diet pattern, Morning after getting up, they were asked to take 100 ml of a juice prepared by themselves at home with gooseberry, ginger, garlic and mint leaves. The method of preparation and the quantity of each constituent were demonstrated to the group before the experiment and the scholar was satisfied with their preparation.

3.4.2.1 Indian Gooseberry

Indian gooseberry seems to work by reducing total cholesterol levels, including the fatty acids called triglycerides, without affecting the "good cholesterol" called high-density lipoprotein (HDL). (*Gooseberry* n.d)

Rich Source of Vitamin C

Amla is the greatest natural source of vitamin C, so instead of tossing vitamin C supplements and pills, try dried amla. It's easily absorbed by the body without causing any harm.

Fig. 3.7 Indian gooseberry

Helpful in Arthritis

Indian gooseberry has anti-inflammatory properties, which help in relieving joint pain and swelling that happens due to arthritis. For this, you can have raw amla or juice everyday in the morning.

Burns Fat

Gooseberry is also known to reduce obesity. It increases the protein level in the body, which, in turn, reduces the unwanted fat. It trims down the cholesterol level. Hence, the risk of heart attack is also decreased. Amla is also very beneficial for diabetic patients. Take amla with turmeric powder or honey regularly to cure diabetes.

Secures against Heart Diseases

Amla is considered very beneficial for heart. It strengthens heart muscles so that the heart is able to pump blood more efficiently. It also controls cholesterol level, thus, reducing the chances of heart attacks.

3.4.2.2 Ginger

Many studies have suggested that increasing consumption of plant foods like ginger decreases the risk of obesity, diabetes, heart disease and overall mortality while promoting a healthy complexion and hair, increased energy and overall lower weight. (*Ginger* n.d)

Digestive issues: The phenolic compounds in ginger are known to help relieve gastrointestinal irritation, stimulate saliva and bile production and suppress gastric contractions and movement of food and fluids through the GI tract.

Fig. 3.8 Ginger

Nausea: Chewing raw ginger or drinking ginger tea is a common home remedy for nausea during cancer treatment. Pregnant women experiencing morning sickness can safely use ginger to relieve nausea and vomiting, often in the form of ginger lozenges or candies. Pain reduction: A study involving 74 volunteers carried out at the University of Georgia found that daily ginger supplementation reduced exercise-induced muscle pain by 25%. Ginger has also been found to reduce the symptoms of dysmenorrhea (severe pain during a menstrual cycle). In one study, 83% of women taking ginger capsules reported improvements in pain symptoms compared to 47% of those on placebo.

Inflammation: Ginger has been used for centuries to reduce inflammation and treat inflammatory conditions. A study published in *Cancer Prevention Research* journal found that a ginger root supplement administered to volunteer participants reduced inflammation markers in the colon within a month. Researchers on the study explained that by decreasing inflammation, the risk of colon cancer is also likely to decrease. Ginger has also shown promise in clinical trials for treating inflammation associated with osteoarthritis.

3.4.2.3 Mint Leaves

Digestion: Mint is a great appetizer or palate cleanser, and it promotes digestion. It also soothes stomachs in cases of indigestion or inflammation. When you feel sick to your stomach, drinking a cup of mint tea can give you relief. Also, if you are someone who travels long distances via plane or boat, the menthol oil derived from mint can be very soothing for nausea and related motion sickness. (*Mint Leaves* n.d)

Fig. 3.9 Mint Leaves

Nausea & Headache: Again, the strong and refreshing aroma of mint is a quick and effective remedy for nausea. Even just the smell of mint oil or freshly crushed mint leaves or

the use of any product with mint flavor, and your stomach issues will be alleviated. In fact, many people keep menthol oil or mint-flavored products with them at all time to avoid nausea. Balms with a mint base or basic mint oil, when rubbed on the forehead and nose, gives quick relief in case of headache. Mint is a naturally soothing substance, so it can alleviate the inflammation and temperature rise that is often associated with headaches and migraines.

Weight Loss: Aside from all the other health benefits of mint, it also can help in your efforts to lose weight in a healthy way! Mint is a stimulant, as we've already mentioned, but it also stimulates the digestive enzymes that absorb nutrients from food and consume fat and turn it into usable energy. Therefore, by adding mint to your diet, you are increasing the amount of fat that is being consumed and put to use, rather than being stored and contributing to your weight gain!

3.4.2.4 Garlic

Strong flavored, garlic cloves contain many noteworthy phyto-nutrients, minerals, vitamins, and antioxidants that have proven health benefits. Total measured antioxidant strength (ORAC value) is 5346 µmol TE/100 g. Its bulbs contain organic thio-sulfinite compounds such as diallyl disulfide, diallyl trisulfide and allyl propyl disulfide. Upon disruption of bulb (while crushing, cutting, etc.), these compounds convert into **allicin** through enzymatic reaction. Laboratory studies show that **allicin** reduces cholesterol production by inhibiting the HMG-CoA reductaseenzyme within the liver cells. (*Garlic* n.d)

Fig. 3.10 Garlic

Allicin decreases blood vessel stiffness through facilitation of nitric oxide (NO) release. Nitric oxide relaxes blood vessels and thereby, bring a reduction in the total blood pressure. Further, it blocks platelet clot formation and has fibrinolytic action inside the blood vessels. This function of allicin helps decrease the overall risk from coronary artery disease (CAD), peripheral vascular diseases (PVD), and stroke. Research studies also suggest that consumption of garlic is associated with a possible decrease in the incidence of stomach cancer. Allicin and other essential volatile compounds also found to have anti-bacterial, anti-viral, and anti-fungal activities. Garlic is an excellent source of minerals and vitamins that are essential for optimum health. The bulbs are one of the richest sources of potassium, iron, calcium, magnesium, manganese, zinc, and selenium. Selenium is a heart-healthy mineral, and is an important cofactor for antioxidant enzymes within the body. Manganese is used by the body as a co-factor for the antioxidant enzyme, superoxide dismutase. Iron is required for red blood cell formation. It contains many flavonoid anti-oxidants like carotene beta, zea-xanthin, and vitamins like vitamin-C. Vitamin C helps the body develop resistance against infectious agents and scavenge harmful, pro-inflammatory free radicals.

Then for the breakfast, the diet regulated group was asked to replace their regular menu with rice preparations and supplement it with ragi porridge, the method of preparation of which was also demonstrated to all the subject by the researcher. The quantity of intake was left to the participants. Evening snacks was permitted to their taste. Afternoon lunch was permitted to their choice with rice preparations. They were advised to restrict the intake of eggs, mutton and beef during the period of the experiment. Night dinner with rice or other preparations they usually take was replaced by ragi idly. The method of preparation of which was also demonstrated by the researcher. The quantity of intake was left to the participants. This group was allowed to do their regular work but they were not permitted to be a part of any organized physical activities and competitions.

3.4.2.5 Ragi Porridge

Millet or Ragi as commonly known is regularly used in the South kitchens. It's in fact the staple diet in many villages across South India. People down South draw their strength heavily through consumption of Ragi porridge (kanji) or Ragi balls which is quite popular there. *(Ragi food preparation* n.d).

Fig. 3.11 Ragi Porridge

3.4.2.6 Ragi Idly

Ragi idly was prepared using ragi flour like rice flour and make idly like rice idly. This is easily digestible food if it is taken with chutney. *(Ragi food preparation* n.d).

Fig. 3.12 Ragi Idly

3.4.3 Combined Group

This group consisted of 30 female subjects of the same age group and they were given yoga training same as the Yogic Exercise group and performed a set of 6 yoga asanas three times daily for 45 minutes for five days in a week under te supervision of the scholar in the school auditorium between 5 and 6 pm. They brought their own yoga mattress and after every session the feedback from the participants and they were counseled properly. They were also instructed to follow the same type of food prescribed for the diet regulated group.

3.5 Selection of Tests

The present study was undertaken primarily to critically analyze and compare Yoga, Diet Regulated and the Combined Groups on selected motor, physiological and biochemical variables among women of age groups between 35 and 45 years. From the available literature, the following standardized tests were selected and used to collect relevant data pertaining to the selected dependent variables and are presented in Table 3.1.

Table 3.1 Selection of tests

S.No	Criterion Variables	Test items	Unit of Measurement
1	Agility	Boomerang Run (Right)	Seconds
2	Hip Flexibility	Sit and Reach Test	Centimetres
3	Leg explosive power	Standing Broad Jump	Centimetres
4	Body Mass Index	(Ht. in Mtrs)^2/ Body weight in Kgs	Ratio
5	Resting pulse rate	Radial pulse method	beats/minute
6	Systolic Blood Pressure	Sphygmomanometer	mmHg
7	Low Density Lipoprotein	a blood test - a lipid profile	mg/dL
8	High Density Lipoprotein	a blood test - a lipid profile	mg/dL
9	Random Blood Sugar	random blood sugar test	mg/dL

3.5.1 Tester Competency

The investigator took all the measurements in this study with the assistance of the yoga masters and experts working with the scholar. To ensure that the investigator was well versed with the technique of conducting tests, he had a number of practice sessions by using the correct testing procedure. The tester's reliability was established by test and re-test method.

3.5.2 Reliability of Instruments

The stopwatch and Standing Broad Jump Mattress with measurements marked on it were purchased from reliable and branded companies and are considered to be accurate enough. The Blood tests were made with the help of a famous and reliable laboratory for measuring, low density lipoprotein, high density lipoprotein and random blood sugar. The resting pulse rate was done by the scholar himself through the radial artery for 15 seconds and the data was multiplied by 4 for getting pulse rate per minute. The systolic blood pressure was measured by a qualified physician.

3.5.3 Reliability of Data

Test and retest method was used in order to establish the reliability of data by using ten subjects at random. The same personnel under similar conditions tested all the selected dependent variables twice for all the subjects. The intra class co-efficient of correlation was used to find out the reliability of the data and the results are presented in Table.2.

Table 3.2 Intra Class Co-Efficient Of Correlation On Selected Variables

S.No	Variables	Intra-class R Value
1	Agility	.98*
2	Hip Flexibility	.94*
3	Leg explosive power	-96*
4	Body Mass Index	.99*
5	Resting pulse rate	.92*
6	Systolic Blood Pressure	.95*
7	Low Density Lipoprotein	.94*
8	High Density Lipoprotein	.91*
9	Random Blood Sugar	.90*

*Significant at 0.01 level of confidence.

Since the table value required for significance at 0.01 level of confidence was 0.77. Since the obtained 'R' values are higher than the required value, the data were accepted as reliable in terms of instrument, tester and the subjects.

3.5.4 Orientation of the subjects

The investigator explained the purpose of the study to the subjects and their role in the study. For the collection of data, the investigator explained the procedure of testing the selected dependent variables and gave instructions about the procedure to be adopted by them for measuring. The subjects of all the groups were sufficiently motivated to perform their maximum level during the testing periods.

3.5.5 Administration of Tests

Agility was measured using Boomerang Run (Right) test by marking with plastic cones as prescribed in the basketball mud court for all the subjects. The same procedure was performed once before the experiment and next after 10 weeks after the experiment (*Boomerang Run* n.d*)*.

3.5.5.1. Boomerang Run Test

By using the Boomerang Run (Right) test , the Agility of all the members was measured and recorded in seconds. Participants ran in the direction indicated by arrows. The orange circles are the cones with the cone numbers showing the order of running from the center station after completing right quarter turns, beginning from “Start” and finishing at “End.”

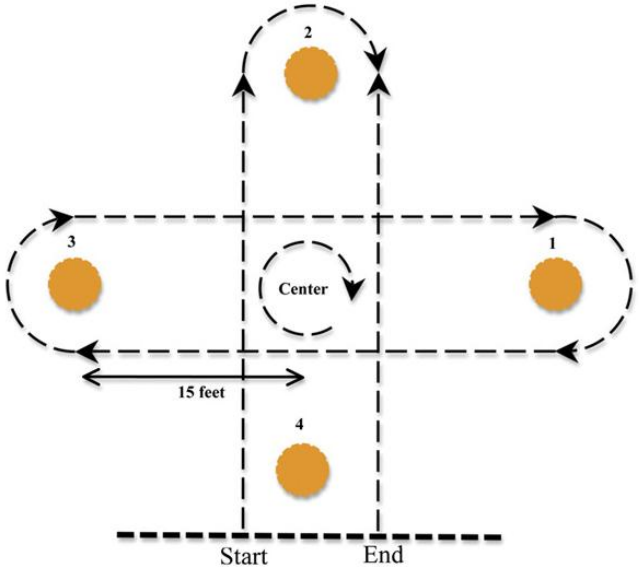

Fig. 3.13 Boomerang Run (Right)

3.5.5.2. Sit and Reach Test

Hip Flexibility was measured by using the Sit and Reach apparatus inside the auditorium of the school and noted in centimeters for all the subjects. The same procedure was performed once before the experiment and next after 10 weeks after the experiment (*Sit and Reach test* n.d.).

This is usually a simple sit and reach test, and it measure the flexibility of the lower back and hamstrings (the muscles on the back of the thighs. The subject completes the test by sitting on the floor with the feet flat against a “sit and reach box.” Then the subject just reaches forward as far as she can. A tape measure at the top of the box will allow the tester to assess the flexibility in centimetres.

Fig. 3.14 Sit and Reach Test

3.5.5.3. Standing Broad Jump

The leg explosive power was measured by using the marked standing broad jump mattress inside the school auditorium for all the 120 subjects. The same procedure was performed once before the experiment and next after 10 weeks after the experiment. (*Standing Broad Jump test* n.d).

The subject stood in one spot, and used her muscles to jump really far without any kind of lead-in. This test required concentration and focus. The distance jumped from the base line on the mat to the heel of the landing was measured as the performance. Three trials were given to the subjects and the best of the three trials were noted as the score of Leg Explosive power in centimeters.

Fig. 3.15 Standing Broad Jump

3.5.5.4. Body Mass Index

Body Mass Index was calculated by using the formula (***Ht. in Mtrs)^2/ Body weight in Kgs)***. The weight of all the subjects were measured using a calibrated weighing machine in kilograms, and a accurately calibrated Stadiometer was used t measure the exact height of the subjects. Then, the body mass index was calculated by applying the above formula and recorded in numbers as ratio. The same procedure was performed once before the experiment and next after 10 weeks after the experiment.

3.5.5.5. Resting pulse rate test

Resting pulse rate test was recorded in rate per minute. The pulse rate of all the subjects were recorded in a sitting position in the morning session between 6.00am and 7.00am; before taking the pulse rate, the subjects were asked to sit on a chair and relax for 15min. To record the pulse rate, the three fingertips were placed on the left radial artery at the wrist in such a manner that pulse was clear and the number of pulse were counted for 15 seconds and converted to one minute. The same procedure was performed once before the experiment and next after 10 weeks after the experiment.

3.5.5.6. The systolic blood pressure

The systolic blood pressure was measured for all the subjects in the morning on two occasions by a qualified physician using a Sphygmomanometer, once before the experiment and next after the completion of the experimental period. The scores thus collected were recorded in mmHg. The same procedure was performed once before the experiment and next after 10 weeks after the experiment.

3.5.5.7. Lipoprotein

Low density lipoprotein, high density lipoprotein and random blood sugar were measured on the same day in the school campus. The qualified lab technician collected the blood samples from all the subjects by 10 am. The subjects assembled there for the test and

after verification from the subjects that they did not take any food with more fat, the technician collected the blood samples. After testing the blood for lipids and random sugar, the data were collected from the laboratory and recorded in mg/dL. The same procedure was performed once before the experiment and next after 10 weeks after the experiment.

3.6 Experimental Design and Statistical Technique

The data were collected from the Yoga, Diet Regulated and the combined groups on selected motor, physiological and biochemical variables among women of age groups between 35 and 45 years. The experimental design for the study was static group comparison design. Analysis of covariance ANCOVA (*Analysis of covariance* n.d) was used to find out the difference among the Yoga, Diet Regulated and the Combined groups on selected motor, physiological and biochemical variables. As the obtained F-ratio was significant, the Scheffe's test was used as a post-hoc test to find out the significant difference between each variable. In all the cases, 0.05 level of significance was used to test the hypotheses. (Clarke and Clarke, 1972)

Chapter IV

ANALYSIS OF DATA AND RESULTS OF THE STUDY

The statistical analysis, the findings, discussion on results and interpretation of the data pertaining to the study are presented in this chapter. The purpose of the present study was to compare and analyze yoga, diet regulated and combined groups on selected motor fitness physiological and biochemical variables among obese women. To achieve the purpose of the study, 120 women in the age group of 35 to 45 years were selected randomly from the walkers in the park in Ambattur in Chennai city. The study was restricted to the following variables such as agility, hip flexibility, leg explosive power, body mass index, resting pulse rate, systolic blood pressure, low density lipoprotein, high density lipoprotein and random blood sugar. All the subjects were tested on the selected criterion variables. The data pertaining to the variables in this study were examined by using Analysis of covariance (ANCOVA) for each variable separately in order to determine the differences if any, among the means. Whenever 'F' ratio was found to be significant, the Scheffe's test was used as post-hoc test to determine the cell mean differences. The level of significance was fixed at 0.05 level for all the cases.

The data thus collected before the experimental administration of the programmes were recorded as Pre Test scores. After the experimental period of 12 weeks, the measurements were made and recorded as the post-test Scores. The eating habits, the profession and the economic and socio-cultural factors of the participants were not taken into account during the process of the statistical process. The collected data were subjected to ANCOVA and the results are presented below:

4.1. Data analysis for Agility

ANCOVA was applied on the performance of Yogic Exercise Group, Diet Regulated Group, the Combined Group and the Control Group for ascertaining the significance of dependent variable agility among the four groups and the obtained results have been presented in Table 4.1 and Table 4.2.

Table 4.1 shows that the Agility is significant at .01 level of confidence with an F- ratio of 12.8 which explained that the mean differences were not occurred due to chance but they differ significantly. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios are 3.16 and 5.01 at the .05 and .01 levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the .01 level, since the F ratio obtained was 12.8. The value of covariance becomes apparent.

The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio is significant, the process should continue.

Table 4.1 ANCOVA Summary for Agility

Source	**SS**	**Df**	**MS**	**F**	**P**
Adjusted means	76	3	25.3	12.8*	<.0001
Adjusted error	228	115	1.99		
Adjusted total	304	118			

*Significant at 0.05 level.

Since the value of F-ratio is greater than the table value, it indicates that there was a significant difference among the means of Yogic Group, Diet Regulated Group, Combined Group and the Control Group on Agility. To find out which of the three paired means had a significant difference, the Scheffe's post-hoc test was applied and the results are presented in table 4.2.

Table 4.2 Ordered Adjusted Agility Means and Differences between Means of Control and Experimental Groups

Combined Group	Yogic Exercise Group	Diet Regulated Group	Control Group	Mean Difference	F- Ratio (Sheffe S Post-hoc test)
22.6			24.6	2.1	31.7715
	23.0		24.6	1.6	19.6728
		23.8	24.6	0.8387	5.15324

Table 4.2 shows the differences between adjusted Agility means of Control Group had significantly lower mean than the means of Combined Group and Yogic Exercise Group at .01 level while applying Scheffe's post-hoc test with F-ratio of 31.8 and 19.67. The difference between the means of and Diet Regulated Group and Control group was significant at .05 levels with F- ratio of 5.15. It was inferred that the Combined Group had improved the Agility level than the Yogic Group and the Dieting Group.

Table 4.3 Initial, Final and Adjusted Means of Agility of Yoga, Diet Regulated, Combined and Control Groups

Groups	Yogic Exercise Group	Diet Regulated Group	Combined Group	Control Group
Initial	24.6	24.6	24.6	24.5
Final	23.1	23.8	22.6	24.6
Adjusted	23	23.8	22.6	24.6

Table 4.3, which is given below, would be helpful just to compare the initial, final and adjusted means and easily understand the differences between them. On the basis of the data provided in Table-4.3, the graphical representation for better understanding of the variables had been provided. The agility had been improved better by the combined group, then the yogic group and then the diet regulated group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent.

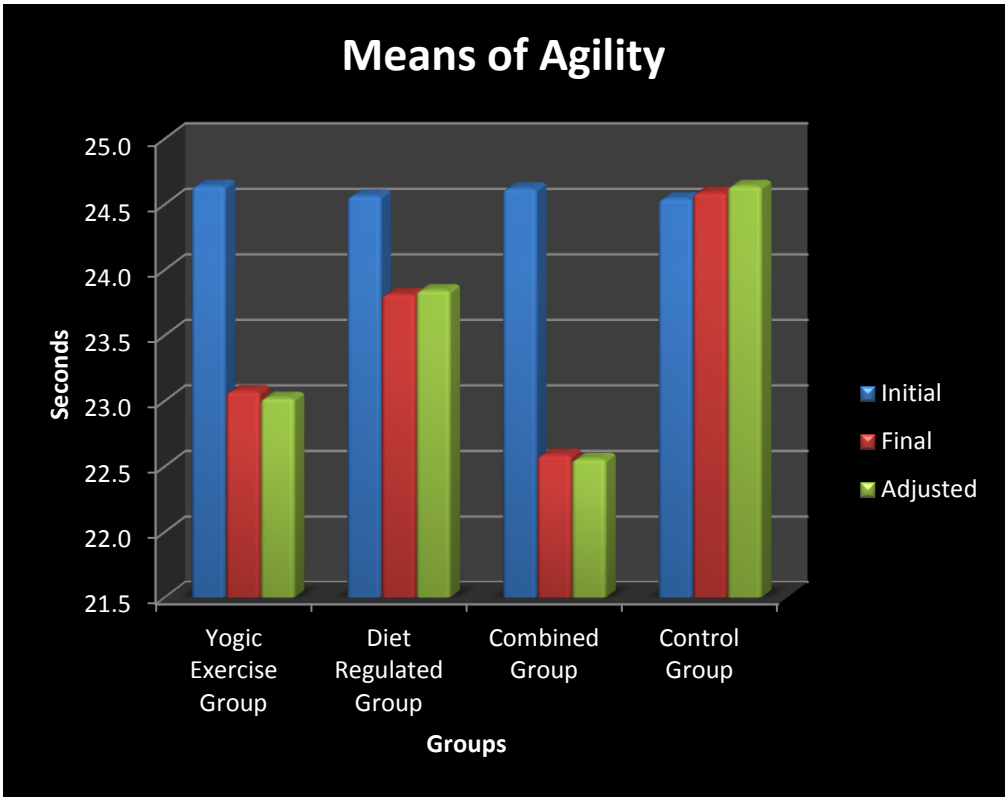

Fig. 4.1 Initial, Final and Adjusted Means of Agility

4.2. Data analysis for Hip Flexibility

ANCOVA was applied on the performance of Yoga Exercise Group, Diet Regulated Group, Combined Group and the Control Group for ascertaining the significance of dependent variable hip flexibility among the four groups and the obtained results have been presented in Table 4.4 and Table 4.5.

Table 4.4 shows that the Hip Flexibility was significant at .01 level of confidence with an F- ratio of 18.4. It explained that the mean differences were not occurred due to chance but they differ significantly. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the .05 and .01 levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the .01 level, since the F ratio obtained was 18.4. The value of covariance became apparent. The final adjustment means have not been determined as the analysis of covariance

was calculated from the adjusted sum of squares. Since the F ratio was significant, the process should continue.

Table 4.4 ANCOVA Summary for Hip Flexibility

Source	SS	Df	MS	F	P
Adjusted means	84.1	3	28	18.4*	<.0001
Adjusted error	175	115	1.52		
Adjusted total	259	118			

*Significant at 0.05 level.

Since the value of F-ratio is greater than the table value, it indicates that there was a significant difference among the means of Yogic Group, Diet Regulated Group, Combined Group and the Control Group on Hip Flexibility. To find out which of the three paired means had a significant difference, the Scheffe's post-hoc test was applied and the results are presented in table 4.5.

Table 4.5 Ordered Adjusted Hip Flexibility Means and Differences between Means of Control and Experimental Groups

Combined Group	Yogic Exercise Group	Diet Regulated Group	Control Group	Mean Difference	F- Ratio (Sheffe S Post-hoc test)
15.49			13.3	2.2	46.2509
	15	14.8	13.3	1.8	28.9539
		14.8	13.3	1.5327	21.7919

Table 4.5 shows the differences between adjusted Hip Flexibility means of Control Group had significantly lower mean than the means of Combined Group and Yogic Exercise Group at .01 level while applying Scheffe's post hoc Test with F-ratio of 46.3 and 28.95. The difference between the means of and Diet Regulated Group and Control group was also significant at .01 levels with F- ratio of 21.79. It was inferred that the Combined Group had improved the Hip Flexibility level than the Yogic Group and the Diet Regulated Group.

Table 4.6 Initial, Final and Adjusted Means of Hip Flexibility of Yogic Exercise, Diet Regulated, Combined and Control Groups

Groups	Yogic Exercise Group	Diet Regulated Group	Combined Group	Control Group
Initial	13.3	13.2	13.2	13.3
Final	15.1	14.7	15.5	13.3
Adjusted	15	14.8	15.5	13.3

Table 4.6, which is given below, would be helpful just to compare the initial, final and adjusted means of Hip Flexibility and easily understand the differences between them. On the basis of the data provided in Table-4.6, the graphical representation for better understanding of the variables had been provided. The hip flexibility had been improved better by the combined group, then the yogic group and then the diet regulated group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent.

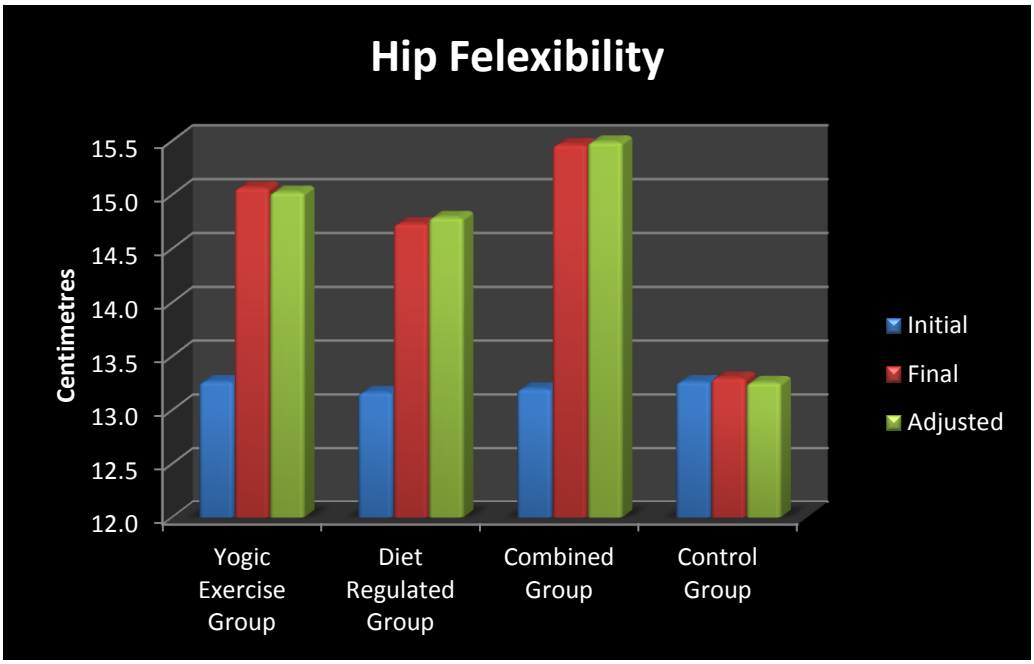

Fig. 4.2. Initial, Final and Adjusted Means of Hip Flexibility

4.3. Data analysis for Leg Explosive Power

ANCOVA was applied on the performance of Yoga Exercise Group, Diet Regulated Group, Combined Group and the Control Group for ascertaining the significance of the dependent variable leg explosive power among the four groups and the obtained results have been presented in Table 4.7 and Table 4.8.

Table 4.7 showed that the Leg Explosive Power was significant at .01 level of confidence with an F- ratio of 7.61. It explained that the mean differences were not occurred due to chance but they differ significantly. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the .05 and .01 levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the .01 level, since the F ratio obtained was 7.61. The value of covariance became apparent.

The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio was significant, the process should continue.

Table 4.7 ANCOVA Summary for Leg Explosive Power

Source	SS	df	MS	F	P
Adjusted means	36.63	3	12.21	7.61*	1E-04
Adjusted error	184.6	115	1.61		
Adjusted total	221.3	118			

*Significant at 0.05 level.

Since the value of F-ratio is greater than the table value, it indicates that there was a significant difference among the means of Yogic Group, Diet Regulated Group, Combined Group and the Control Group on Leg Explosive Power. To find out which of the three paired means had a significant difference, the Scheffe's post-hoc test was applied and the results are presented in table 4.8.

Table 4.8 Ordered Adjusted Leg Explosive Power Means and Differences between Means of Control and Experimental Groups

Combined Group	Yogic Exercise Group	Diet Regulated Group	Control Group	Mean Difference	F- Ratio (Sheffe S Post-hoc test)
16.7			15.26	1.4	18.3424
	16.49		15.26	1.2	13.39625
		16.32	15.26	1.0561	9.958457

Table 4.8 shows the differences between adjusted Leg Explosive Power means of Control Group had significantly lower mean than the means of Combined Group and Yogic Exercise Group at .01 level while applying Scheffe's post hoc Test with F-ratio of 18.34 and 13.4. The difference between the means of and Diet Regulated Group and Control group was also significant at .01 levels with F- ratio of 9.99. It was inferred that the Combined Group had improved the Leg Explosive Power level than the Yogic Group and the Diet Regulated Group.

Table 4.9 Initial, Final and Adjusted Means of Leg Explosive Power of Yoga, Diet Regulated, Combined and Control Groups

	Yogic Exercise Group	Diet Regulated Group	Combined Group	Control Group
Initial	15.27	15.23	15.40	15.40
Final	16.43	16.23	16.77	15.33
Adjusted	16.49	16.32	16.7	15.26

Table 4.9, which is given below, would be helpful just to compare the initial, final and adjusted means of Leg Explosive Power and easily understand the differences between them.

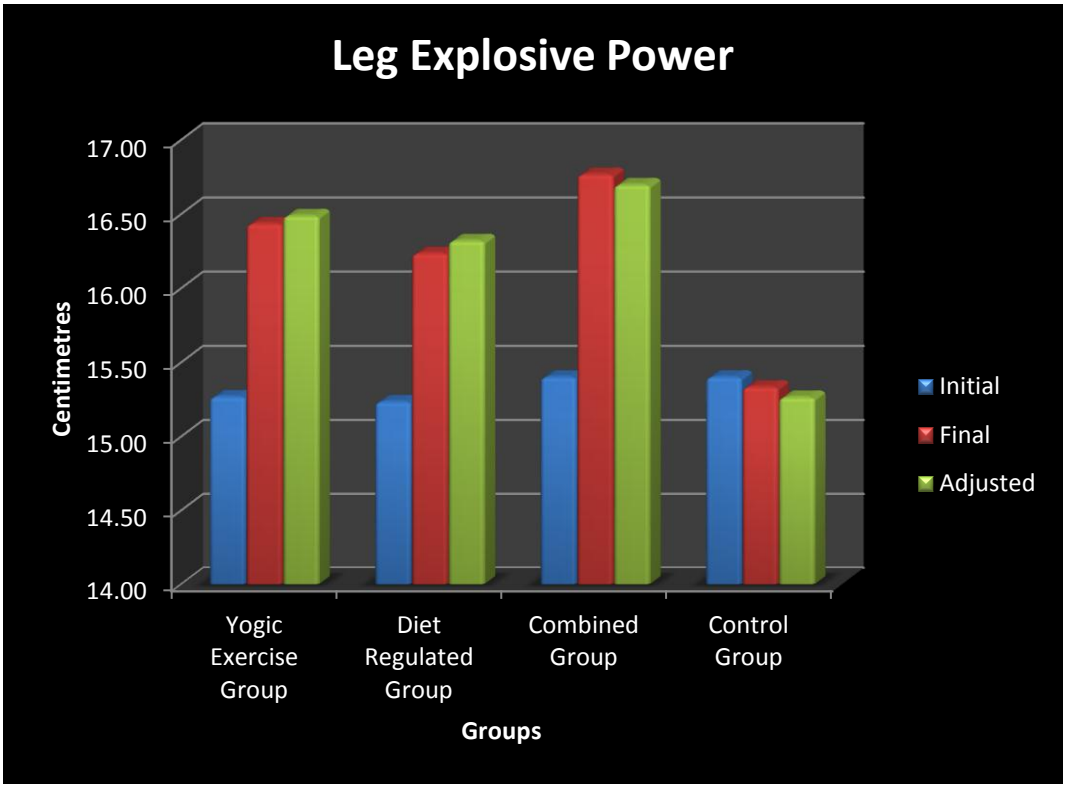

Fig.4.3. Initial, Final and Adjusted Means of Leg Explosive Power

On the basis of the data provided in Table-4.9, the graphical representation for better understanding of the variables had been provided. The leg explosive power had been improved better by the combined group, then the yogic group and then the diet regulated group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent.

4.4. Data analysis for Body Mass Index

ANCOVA was applied on the performance of Yoga Exercise Group, Diet Regulated Group, Combined Group and the Control Group for ascertaining the significance of dependent variable body mass index among the four groups and the obtained results have been presented in Table 4.10 and Table 4.11.

Table 4.10 showed that the Body mass index was significant at .01 level of confidence with an F- ratio of 15.96. It explained that the mean differences were not occurred due to chance but they differ significantly. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the .05 and .01 levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the .01 level, since the F ratio obtained was 15.96. The value of covariance became apparent.

The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio was significant, the process should continue.

Table 4.10 ANCOVA Summary for Body Mass Index

Source	SS	df	MS	F	P
Adjusted means	96.53	3	32.18	15.96*	<.0001
Adjusted error	231.8	115	2.02		
Adjusted total	328.3	118			

*Significant at 0.05 level.

Since the value of F-ratio is greater than the table value, it indicates that there was a significant difference among the means of Yogic Group, Diet Regulated Group, Combined Group and the Control Group on Body Mass Index. To find out which of the three paired means had a significant difference, the Scheffe's post-hoc test was applied and the results are presented in table 4.11.

Table 4.11 Ordered Adjusted Body Mass Index Means and Differences between Means of Control and Experimental Groups

Combined Group	Diet Regulated Group	Yogic Exercise Group	Control Group	Mean Difference	F- Ratio (Sheffe S Post-hoc test)
25.73			28.211	2.478	47.41686
	26.53		28.211	1.6782	21.74792
		26.99	28.211	1.2223	11.53681

Table 4.11 shows the differences between adjusted Body Mass Index means of Control Group had significantly lower mean than the means of Combined Group and Diet Regulated Group at .01 level while applying Scheffe's post hoc Test with F-ratio of 47.42 and 21.75. The difference between the means of and Yogic Exercise Group and Control group was also significant at .01 levels with F- ratio of 11.54. It was inferred that the Combined Group had improved the Body Mass Index level than the Yogic Group and the Diet Regulated Group.

Table 4.12 Initial, Final and Adjusted Means of Body Mass Index of Yoga, Diet Regulated, Combined and Control Groups

	Yogic Exercise Group	Diet Regulated Group	Combined Group	Control Group
Initial	28.26	28.24	28.29	28.30
Final	27.00	26.54	25.74	28.25
Adjusted	26.99	26.53	25.733	28.21

Table 4.12, which is given below, would be helpful just to compare the initial, final and adjusted means of Body Mass Index and easily understand the differences between them.

On the basis of the data provided in Table-4.12, the graphical representation for better understanding of the variables had been provided. The leg explosive power had been improved better by the combined group, and then the diet regulated group and then the yogic group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent

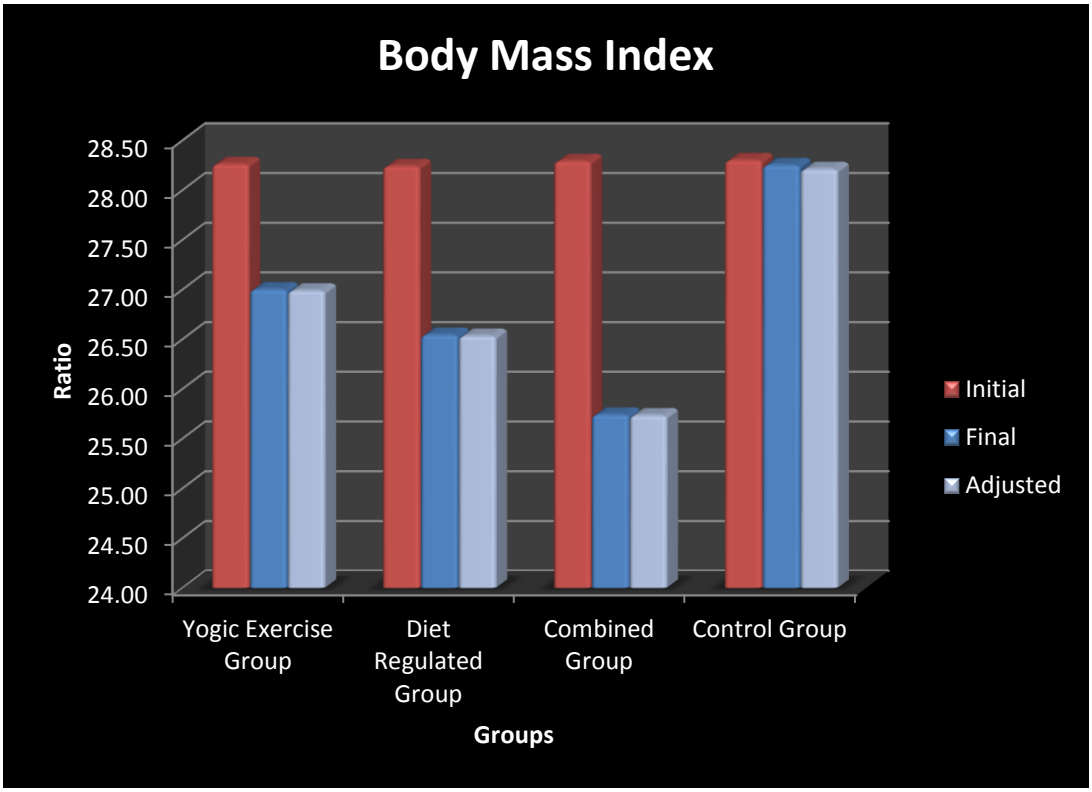

Fig. 4.4. Initial, Final and Adjusted Means of Body Mass Index

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4.5. Data analysis for Resting Pulse Rate

ANCOVA was applied on the performance of Yoga Exercise Group, Diet Regulated Group, Combined Group and the Control Group for ascertaining the significance of dependent variable resting pulse rate among the four groups and the obtained results have been presented in Table 4.13 and Table 4.14.

Table 4.13 showed that the Resting Pulse Rate was significant at .01 level of confidence with an F- ratio of 10.58. It explained that the mean differences were not occurred due to chance but they differ significantly. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the .05 and .01 levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the .01 level, since the F ratio obtained was 10.58. The value of covariance became apparent.

The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio was significant, the process should continue.

Table 4.13 ANCOVA Summary for Resting Pulse Rate

Source	SS	df	MS	F	P
Adjusted means	161.5	3	53.83	10.58*****	3E-06
Adjusted error	585.1	115	5.09		
Adjusted total	746.6	118			

*****Significant at 0.05 level.

Since the value of F-ratio is greater than the table value, it indicates that there was a significant difference among the means of Yogic Group, Diet Regulated Group, Combined Group and the Control Group on Resting Pulse Rate. To find out which of the three paired means had a significant difference, the Scheffe's post-hoc test was applied and the results are presented in table 4.14.

Table 4.14 Ordered Adjusted Resting Pulse Rate Means and Differences between Means of Control and Experimental Groups

Yogic Exercise Group	Combined Group	Diet Regulated Group	Control Group	Mean Difference	F- Ratio (Sheffe S Post-hoc test)
81.02			83.97	2.9541	24.73556
	81.24		83.97	2.7343	21.1916
		82.13	83.97	1.8406	9.602631

Table 4.14 shows the differences between adjusted Resting Pulse Rate means of Control Group had significantly lower mean than the means of Yogic Exercise Group and Combined Group at .01 level while applying Scheffe's post hoc Test with F-ratio of 24.74 and 21.19. The difference between the means of and Diet Regulated Group and Control group was also significant at .01 levels with F- ratio of 9.6. It was inferred that the Yogic Exercise group had improved the Resting Pulse Rate level than the Diet Regulated Group and the Combined Group.

Table 4.15, which is given below, would be helpful just to compare the initial, final and adjusted means of Resting Pulse Rate and easily understand the differences between them.

Table 4.15: Initial, Final and Adjusted Means of Resting Pulse Rate of Yoga, Diet Regulated, Combined and Control Groups

	Yogic Exercise Group	Diet Regulated Group	Combined Group	Control Group
Initial	84.13	84.27	84.00	84.67
Final	80.93	82.13	81.07	84.23
Adjusted	81.02	82.13	81.24	83.97

On the basis of the data provided in Table-4.15, the graphical representation for better understanding of the variables had been provided. The resting pulse rate had been improved better by the yogic group, and then the combined group and then the diet regulated group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent.

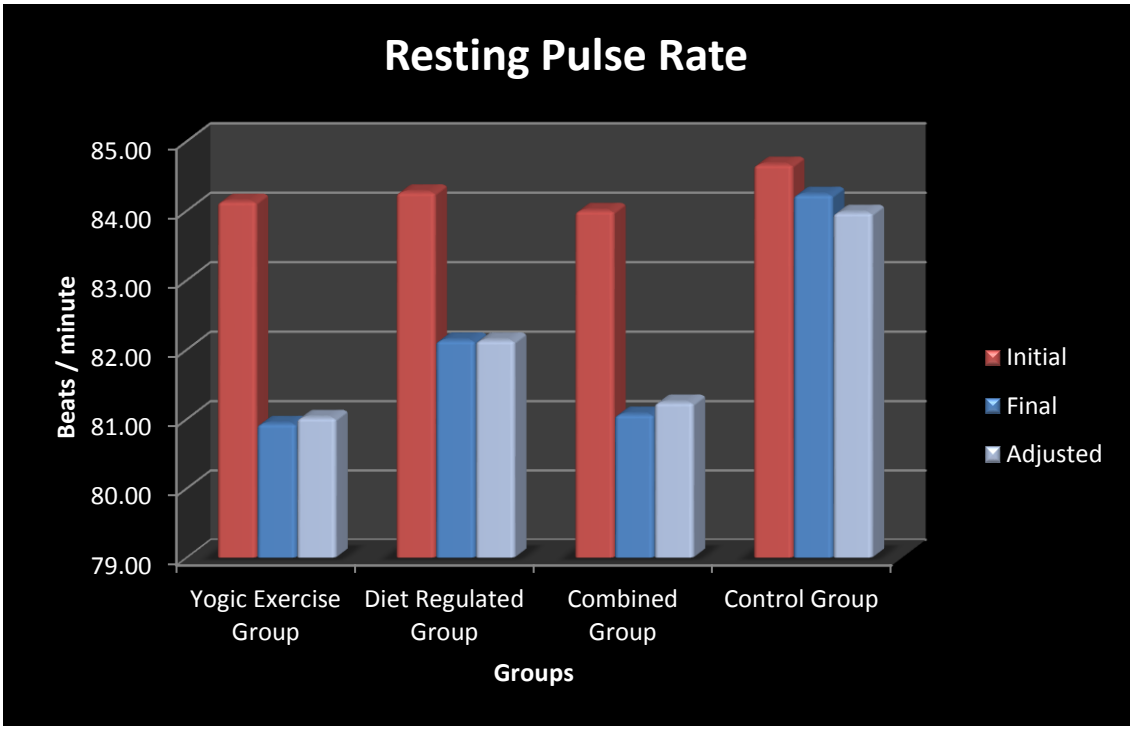

Fig. 4.5 Initial, Final and Adjusted Means of Resting Pulse Rate

4.6. Data analysis for Systolic Blood Pressure

ANCOVA was applied on the performance of Yoga Exercise Group, Diet Regulated Group, Combined Group and the Control Group for ascertaining the significance of dependent variable systolic blood pressure among the four groups and the obtained results have been presented in Table 4.16 and Table 4.17.

Table 4.16 showed that the Systolic Blood Pressure was significant at .01 level of confidence with an F- ratio of 5.04. It explained that the mean differences were not occurred due to chance but they differ significantly. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the .05 and .01 levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the .01 level, since the F ratio obtained was 5.04. The value of covariance became apparent.

The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio was significant, the process should continue.

Table 4.16: ANCOVA Summary for Systolic Blood Pressure

Source	SS	Df	MS	F	P
Adjusted means	845.4	3	281.8	5.04*****	0.003
Adjusted error	6426	115	55.88		
Adjusted total	7272	118			

*****Significant at 0.05 level.

Since the value of F-ratio is greater than the table value, it indicates that there was a significant difference among the means of Yogic Group, Diet Regulated Group, Combined Group and the Control Group on Systolic Blood Pressure. To find out which of the three paired means had a significant difference, the Scheffe's post-hoc test was applied and the results are presented in table 4.17.

Table 4.17 Ordered Adjusted Systolic Blood Pressure Means and Differences between Means of Control and Experimental Groups

Combined Group	Yogic Exercise Group	Diet Regulated Group	Control Group	Mean Difference	F- Ratio (Sheffe S Post-hoc test)
125.6			132.3	6.6596	11.18206
	126.1		132.3	6.1605	9.568796
		128.9	132.3	3.3333	2.801394

Table 4.17 shows the differences between adjusted Systolic Blood Pressure means of Control Group had significantly lower mean than the means of Combined Group and Yogic Exercise Group at .01 level while applying Scheffe's post hoc Test with F-ratio of 11.18 and 9.57. The difference between the means of and Diet Regulated Group and Control group were not significant at .01 levels with F- ratio of 2.80. It was inferred that the Combined Group had improved the Systolic Blood Pressure level than the Yogic Exercise Group and Diet Regulated Group.

Table 4.18, which is given below, would be helpful just to compare the initial, final and adjusted means of Systolic Blood Pressure and easily understand the differences between them.

Table 4.18 Initial, Final and Adjusted Means of Systolic Blood Pressure of Yoga, Diet Regulated, Combined and Control Groups

	Yogic Exercise Group	Diet Regulated Group	Combined Group	Control Group
Initial	132.5	132.4	132.3	132.4
Final	126.2	128.9	125.6	132.3
Adjusted	126.1	128.9	125.6	132.3

On the basis of the data provided in Table-4.18, the graphical representation for better understanding of the variables had been provided. The systolic blood pressure had been improved better by the combined group, and then the yogic group and then the diet regulated group. These mean differences had been established using the statistical techniques. The

improvement in the means was not just by chance but only due to the experimental treatments the groups underwent.

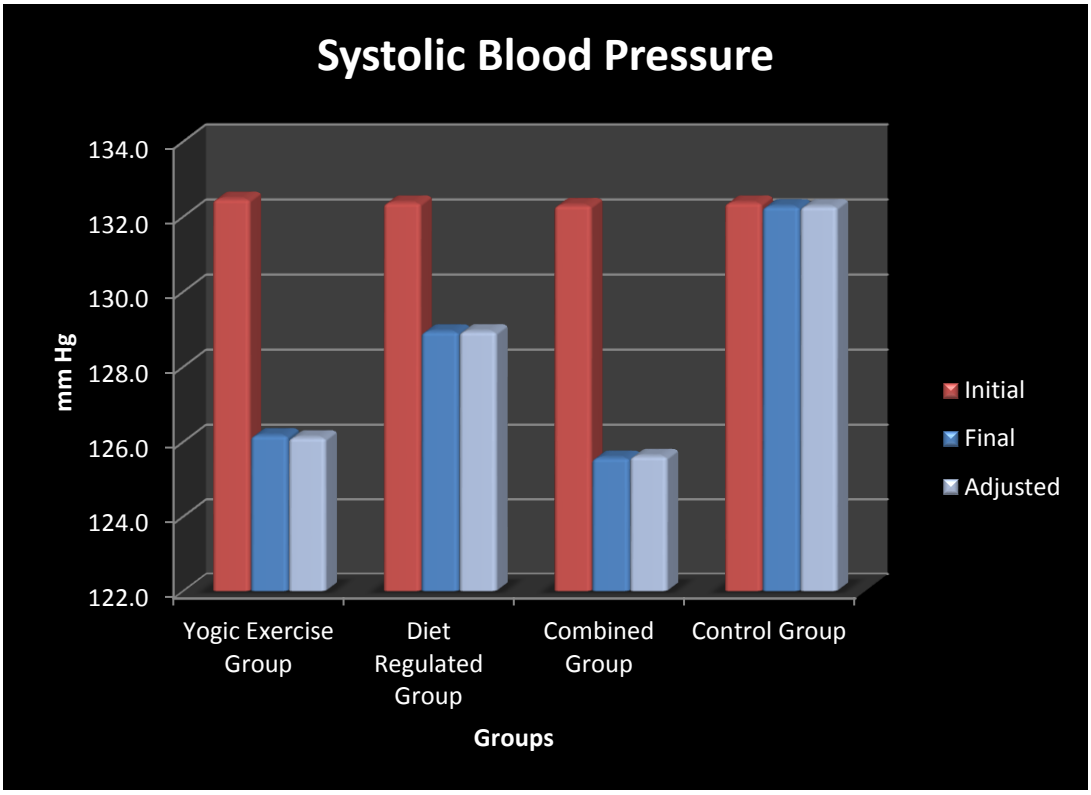

Fig. 4.6 Initial, Final and Adjusted Means of Systolic Blood Pressure

4.7. Data analysis for Low Density Lipoprotein

ANCOVA was applied on the performance of Yoga Exercise Group, Diet Regulated Group, Combined Group and the Control Group for ascertaining the significance of dependent variable low density lipoprotein among the four groups and the obtained results have been presented in Table 4.19 and Table 4.20.

Table 4.19 showed that the Low Density Lipoprotein was significant at .01 level of confidence with an F- ratio of 11.99. It explained that the mean differences were not occurred due to chance but they differ significantly. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the .05 and

.01 levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the .01 level, since the F ratio obtained was 11.99. The value of covariance became apparent.

The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio was significant, the process should continue.

Table 4.19 ANCOVA Summary for Low Density Lipoprotein

Source	SS	Df	MS	F	P
Adjusted means	437	3	145.7	11.99*****	1E-06
Adjusted error	1398	115	12.15		
Adjusted total	1835	118			

*****Significant at 0.05 level.

Since the value of F-ratio is greater than the table value, it indicates that there was a significant difference among the means of Yogic Group, Diet Regulated Group, Combined Group and the Control Group on Low Density Lipoprotein. To find out which of the three paired means had a significant difference, the Scheffe's post-hoc test was applied and the results are presented in table 4.20.

Table 4.20 Ordered Adjusted Low Density Lipoprotein Means and Differences between Means of Control and Experimental Groups

Combined Group	Diet Regulated Group	Yogic Exercise Group	Control Group	Mean Difference	F- Ratio (Sheffe S Post-hoc test)
125.2			130.4	5.2	32.09794
	126.6		130.4	3.8	17.29845
		127.3	130.4	3.0924	11.30906

Table 4.20 shows the differences between adjusted Low Density Lipoprotein means of Control Group had significantly lower mean than the means of Yogic Exercise Group and Combined Group at .01 level while applying Scheffe's post hoc Test with F-ratio of 24.74 and

21.19. The difference between the means of and Diet Regulated Group and Control group was also significant at .01 levels with F- ratio of 9.6. It was inferred that the Yogic Exercise Group had improved the Low Density Lipoprotein level than the Diet Regulated Group and the Combined Group.

Table 4.21, which is given below, would be helpful just to compare the initial, final and adjusted means of Low Density Lipoprotein and easily understand the differences between them.

Table 4.21: Initial, Final and Adjusted Means of Low Density Lipoprotein of Yoga, Diet Regulated, Combined and Control Groups

	Yogic Exercise Group	Diet Regulated Group	Combined Group	Control Group
Initial	130.4	130.6	130.7	130.8
Final	127.1	126.6	125.3	130.6
Adjusted	127.3	126.6	125.2	130.4

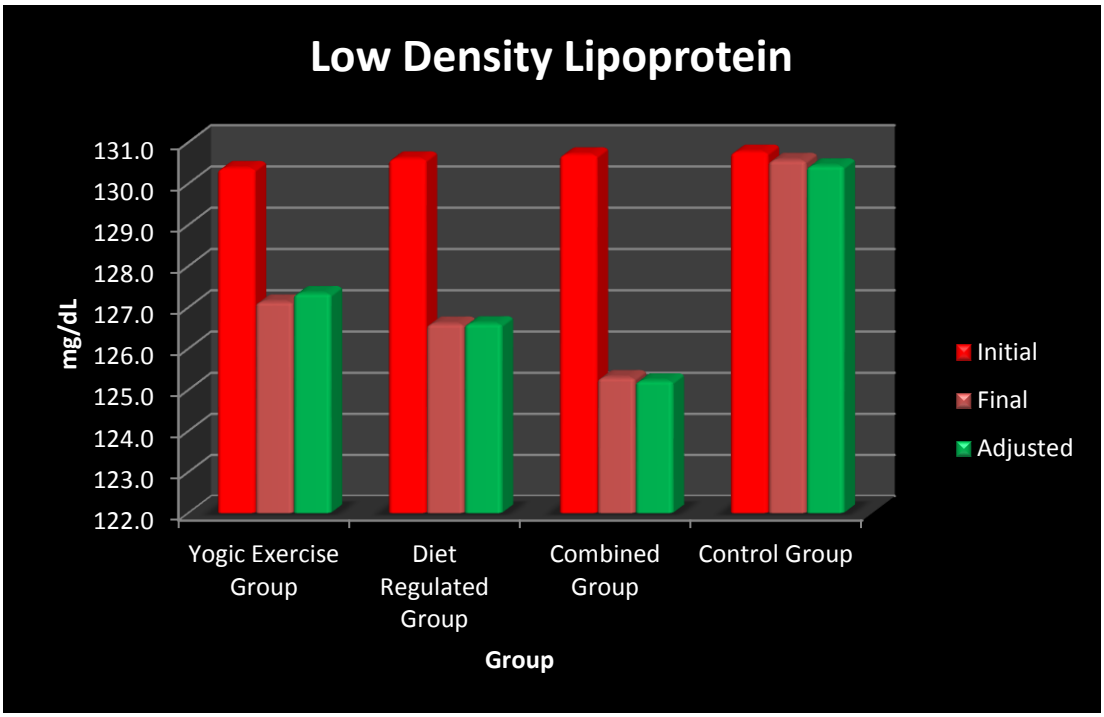

Fig. 4.7 Initial, Final and Adjusted Means of Low Density Lipoprotein

On the basis of the data provided in Table-4.21, the graphical representation for better understanding of the variables had been provided. The systolic blood pressure had been improved better by the combined group, and then the diet regulated group and then the yogic group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent

4.8. Data analysis for High Density Lipoprotein

ANCOVA was applied on the performance of Yoga Exercise Group, Diet Regulated Group, Combined Group and the Control Group for ascertaining the significance of dependent variable high density lipoprotein among the four groups and the obtained results have been presented in Table 4.22 and Table 4.23.

Table 4.22 showed that the High Density Lipoprotein was significant at .01 level of confidence with an F- ratio of 17.72. It explained that the mean differences were not occurred due to chance but they differ significantly. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the .05 and .01 levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the .01 level, since the F ratio obtained was 17.72. The value of covariance became apparent.

The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio was significant, the process should continue.

Table 4.22 ANCOVA Summary for High Density Lipoprotein

Source	SS	Df	MS	F	P
Adjusted means	172.9	3	57.63	17.72*****	<.0001
Adjusted error	374	115	3.25		
Adjusted total	546.9	118			

*****Significant at 0.05 level.

Since the value of F-ratio is greater than the table value, it indicates that there was a significant difference among the means of Yogic Group, Diet Regulated Group, Combined Group and the Control Group on High Density Lipoprotein. To find out which of the three paired means had a significant difference, the Scheffe's post-hoc test was applied and the results are presented in table 4.23.

Table 4.23 Ordered Adjusted High Density Lipoprotein Means and Differences between Means of Control and Experimental Groups

Combined Group	Diet Regulated Group	Yogic Exercise Group	Control Group	Mean Difference	F- Ratio (Sheffe S Post-hoc test)
50.52			47.43	3.1	41.83124
	50.18		47.43	2.8	33.28045
		49.14	47.43	1.71	12.80513

Table 4.23 shows the differences between adjusted High Density Lipoprotein means of Control Group had significantly lower mean than the means of Combined Group and Diet Regulated Group at .01 level while applying Scheffe's post hoc test with F-ratio of 41.83 and 33.28. The difference between the means of and Yogic Exercise Group and Control group was also significant at .01 levels with F- ratio of 12.81. It was inferred that the Combined Group had improved the High Density Lipoprotein level than the Diet Regulated Group and the Yogic Exercise Group.

Table 4.24, which is given below, would be helpful just to compare the initial, final and adjusted means of High Density Lipoprotein and easily understand the differences between them.

Table 4.24 Initial, Final and Adjusted Means of High Density Lipoprotein of Yoga, Diet Regulated, Combined and Control Groups

	Yogic Exercise Group	Diet Regulated Group	Combined Group	Control Group
Initial	47.33	47.43	47.43	47.30
Final	49.10	50.23	50.57	47.37
Adjusted	49.14	50.18	50.52	47.43

On the basis of the data provided in Table-4.24, the graphical representation for better understanding of the variables had been provided. The systolic blood pressure had been improved better by the combined group, and then the diet regulated group and then the yogic group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent

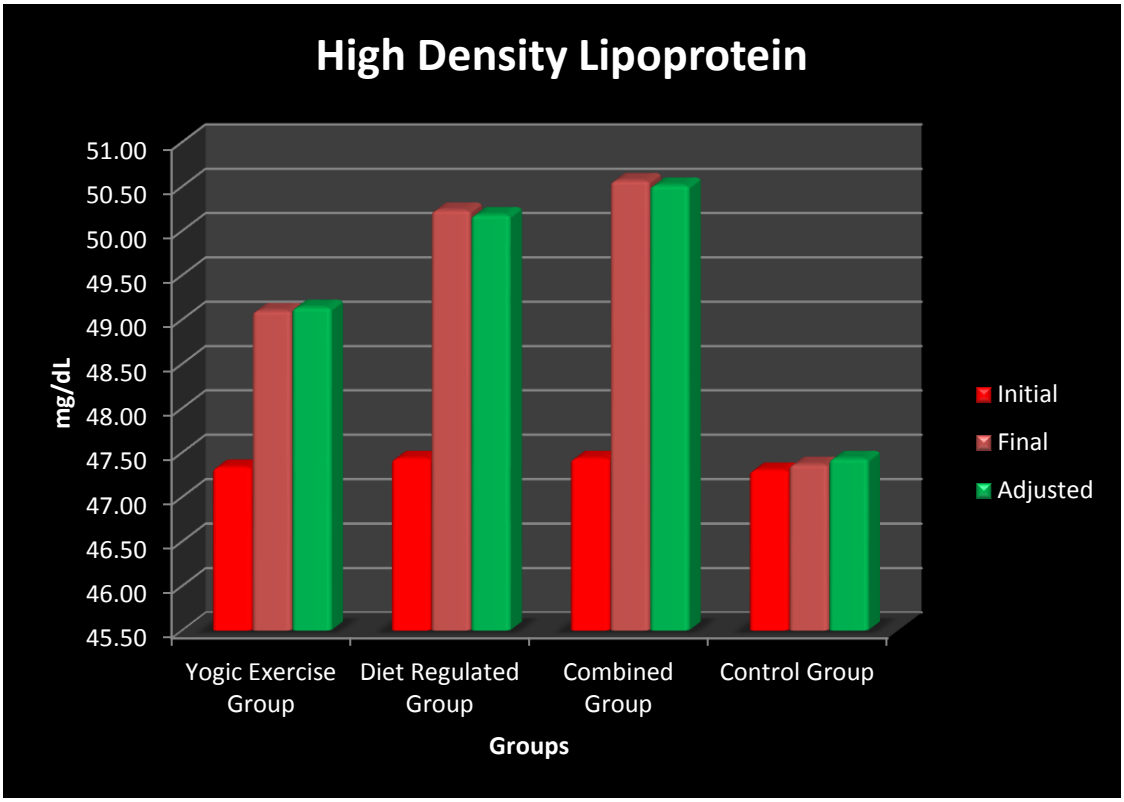

Fig. 4.8 Initial, Final and Adjusted Means of High Density Lipoprotein

4.9. Data analysis for Random Blood Sugar

ANCOVA was applied on the performance of Yoga Exercise Group, Diet Regulated Group, Combined Group and the Control Group for ascertaining the significance of independent variable random blood sugar among the four groups and the obtained results have been presented in Table 4.25 and Table 4.26.

Table 4.25 showed that the Random Blood Sugar was significant at .01 level of confidence with an F- ratio of 13.22. It explained that the mean differences were not occurred due to chance but they differ significantly. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the .05 and .01 levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the .01 level, since the F ratio obtained was 13.22. The value of covariance became apparent.

The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio was significant, the process should continue.

Table 4.25 ANCOVA Summary for Random Blood Sugar

Source	SS	Df	MS	F	P
Adjusted means	377.2	3	125.7	13.22*	<.0001
Adjusted error	1094	115	9.51		
Adjusted total	1471	118			

*Significant at 0.05 level.

Since the value of F-ratio is greater than the table value, it indicates that there was a significant difference among the means of Yogic Group, Diet Regulated Group, Combined Group and the Control Group on Random Blood Sugar. To find out which of the three paired means had a significant difference, the Scheffe's post-hoc test was applied and the results are presented in table 4.26.

Table 4.26 Ordered Adjusted Random Blood Sugar Means and Differences between Means of Control and Experimental Groups

Combined Group	Diet Regulated Group	Yogic Exercise Group	Control Group	Mean Difference	F- Ratio (Sheffe S Post-hoc test)
145.1			149.7	4.6	37.27569
	145.8		149.7	3.9	26.78822
		146.6	149.7	3.14	17.0794

Table 4.26 shows the differences between adjusted Random Blood Sugar means of Control Group had significantly lower mean than the means of Combined Group and Diet Regulated Group at .01 level while applying Scheffe's post hoc test with F-ratio of 41.83 and 33.28. The difference between the means of and Yogic Exercise Group and Control group was also significant at .01 levels with F- ratio of 12.81. It was inferred that the Combined Group had improved the Random Blood Sugar level than the Diet Regulated Group and the Yogic Exercise Group.

Table 4.27, which is given below, would be helpful just to compare the initial, final and adjusted means of Random Blood Sugar and easily understand the differences between them.

Table 4.27 Initial, Final and Adjusted Means of Random Blood Sugar of Yoga, Diet Regulated, Combined and Control Groups

	Yogic Exercise Group	Diet Regulated Group	Combined Group	Control Group
Initial	149.6	149.7	149.6	149.7
Final	146.5	145.8	145.0	149.8
Adjusted	146.6	145.8	145.1	149.7

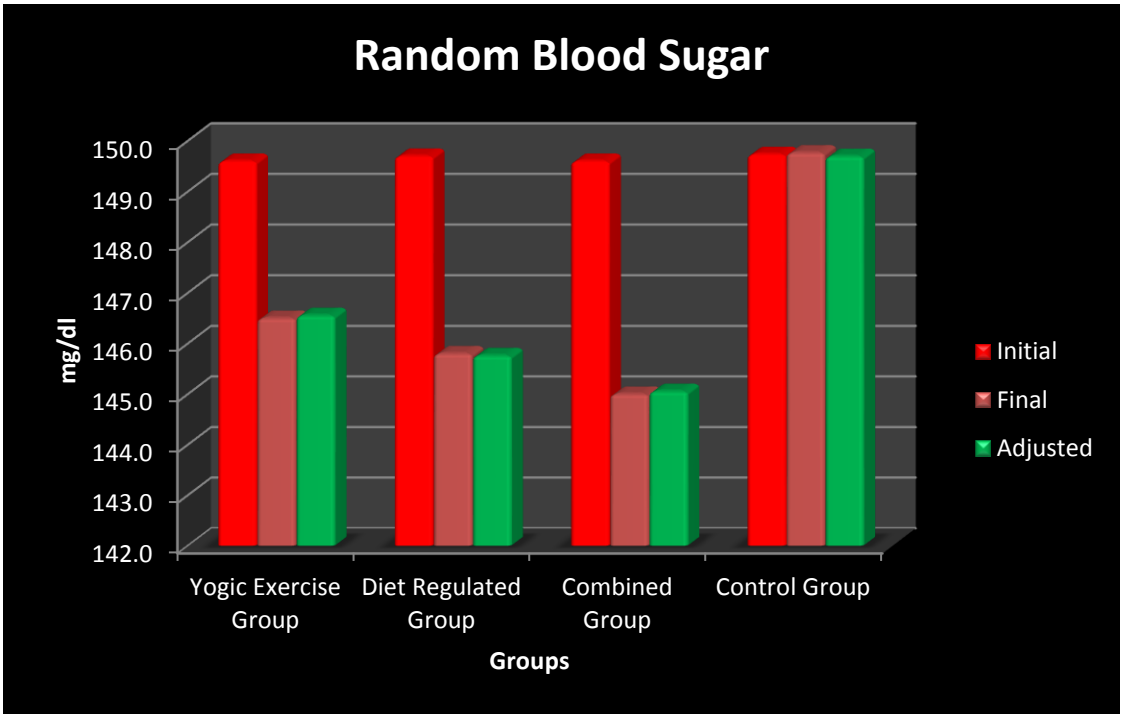

Fig. 4.9 Initial, Final and Adjusted Means of Random Blood Sugar

On the basis of the data provided in Table-4.27, the graphical representation for better understanding of the variables had been provided. The systolic blood pressure had been improved better by the combined group, and then the diet regulated group and then the yogic group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent

4.10. Discussion of findings on Motor Fitness Variables

4.10.1 Agility

The differences between adjusted Agility means of Control Group had significantly lower mean than the means of Combined Group and Yogic Exercise Group at .01 level with F-ratio of 31.8 and 19.67. The difference between the means of and Diet Regulated Group and Control group was significant at .05 levels with F- ratio of 5.15. It was inferred that the Combined Group had improved the Agility level than the Yogic Group and the Dieting Group.

4.10.2 Hip Flexibility

The differences between adjusted Hip Flexibility means of Control Group had significantly lower mean than the means of Combined Group and Yogic Exercise Group at .01 level while applying Scheffe's post hoc Test with F-ratio of 46.3 and 28.95. The difference between the means of and Diet Regulated Group and Control group was also significant at .01 levels with F- ratio of 21.79. It was inferred that the Combined Group had improved the Hip Flexibility level than the Yogic Group and the Diet Regulated Group.

4.10.3 Leg Explosive Power

The differences between adjusted Hip Flexibility means of Control Group had significantly lower mean than the means of Combined Group and Yogic Exercise Group at .01 level while applying Scheffe's post hoc Test with F-ratio of 46.3 and 28.95. The difference between the means of and Diet Regulated Group and Control group was also significant at .01 levels with F- ratio of 21.79. It was inferred that the Combined Group had improved the Leg Explosive Power level than the Yogic Group and the Diet Regulated Group.

The above findings were found in consonance with the studies conducted by the researchers (Hruda et al. 2003). The findings of the present study were in line with the studies conducted by (Nakamura 2007), (Bottaro et al. 2007), (Halder et al., 2015), and (Mahalingam and Vairamani 2015).

4.11 Discussion of findings on Physiological Variables

4.11.1. Body Mass Index

The differences between adjusted Body Mass Index means of Control Group had significantly lower mean than the means of Combined Group and Diet Regulated Group at .01 level while applying Scheffe's post hoc Test with F-ratio of 47.42 and 21.75. The difference between the means of and Yogic Exercise Group and Control group was also significant at .01 levels with F- ratio of 11.54. It was inferred that the Combined Group had improved the Body Mass Index level than the Yogic Group and the Diet Regulated Group.

4.11.2 Resting Pulse Rate

The differences between adjusted Resting Pulse Rate means of Control Group had significantly lower mean than the means of Yogic Exercise Group and Combined Group at .01 level while applying Scheffe's post hoc Test with F-ratio of 24.74 and 21.19. The difference between the means of and Diet Regulated Group and Control group was also significant at .01 levels with F- ratio of 9.6. It was inferred that the Yogic Exercise group had improved the Resting Pulse Rate level than the Diet Regulated Group and the Combined Group.

4.11.3 Systolic Blood Pressure

The differences between adjusted Systolic Blood Pressure means of Control Group had significantly lower mean than the means of Combined Group and Yogic Exercise Group at .01 level while applying Scheffe's post hoc Test with F-ratio of 11.18 and 9.57. The difference between the means of and Diet Regulated Group and Control group were not significant at .01 levels with F- ratio of 2.80. It was inferred that the Combined Group had improved the Systolic Blood Pressure level than the Yogic Exercise Group and Diet Regulated Group.

The above findings were found in consonance with the studies conducted by the researchers (Stacey et al. 2015), (Mishra Pandey and Dubey 2015), (Djoussé and Gaziano 2008), (Dutta and Singh 2014) and (Dabrowska et al. 2015).

4.12. Discussion of findings on Biochemical Variables

4.12.1. Low Density Lipoprotein

The differences between adjusted Low Density Lipoprotein means of Control Group had significantly lower mean than the means of Yogic Exercise Group and Combined Group at .01 level while applying Scheffe's post hoc Test with F-ratio of 24.74 and 21.19. The difference between the means of and Diet Regulated Group and Control group was also significant at .01 levels with F- ratio of 9.6. It was inferred that the Yogic Exercise Group had improved the Low Density Lipoprotein level than the Diet Regulated Group and the Combined Group.

4.12.2. High Density Lipoprotein

The differences between adjusted High Density Lipoprotein means of Control Group had significantly lower mean than the means of Combined Group and Diet Regulated Group at .01 level while applying Scheffe's post hoc test with F-ratio of 41.83 and 33.28. The difference between the means of and Yogic Exercise Group and Control group was also significant at .01 levels with F- ratio of 12.81. It was inferred that the Combined Group had improved the High Density Lipoprotein level than the Diet Regulated Group and the Yogic Exercise Group.

4.12.3. Random Blood Sugar

The differences between adjusted Random Blood Sugar means of Control Group had significantly lower mean than the means of Combined Group and Diet Regulated Group at .01 level while applying Scheffe's post hoc test with F-ratio of 41.83 and 33.28. The difference between the means of and Yogic Exercise Group and Control group was also significant at .01 levels with F- ratio of 12.81. It was inferred that the Combined Group had improved the Random Blood Sugar level than the Diet Regulated Group and the Yogic Exercise Group.

The above findings were found in consonance with the studies conducted by the researchers (Misra et al. 2011), (Kehoe, et al. 2015), (Kumar Trivedi and Dixit 2015), (Dabrowska et al. 2015), (Zmijewski et al. 2015), (Heitmann et al. 2015) and (Chaturvedi et al. 2015).

4.13. Discussion on Hypotheses

1. In the first hypothesis it was stated that there would be a significant difference on the selected motor variables among the Yogic, Diet Regulated, Combined and the Control groups. The result of the present study revealed that there was a significant difference among Yogic, Diet Regulated, Combined and the Control groups on the selected motor variables Agility, Hip Flexibility and Leg Explosive power. Hence, the first hypothesis was accepted at 0.05 level of confidence.

2. In the second hypothesis it was stated that there would be a significant difference on the selected physiological variables among the Yogic, Diet Regulated, Combined and the Control groups. The result of the present study revealed that there was a significant difference among Yogic, Diet Regulated, Combined and the Control groups on the selected physiological variables Body Mass Index, Resting Pulse rate and Systolic Blood Pressure. Hence, the second hypothesis was accepted at 0.05 level of confidence.

3. In the third hypothesis it was stated that there would be a significant difference on the selected biochemical variables among the Yogic, Diet Regulated, Combined and the Control groups. The result of the present study revealed that there was a significant difference among Yogic, Diet Regulated, Combined and the Control groups on the selected biochemical variables Low Density Lipoprotein, High Density Lipoprotein and Random Blood Sugar. Hence, the third hypothesis was accepted at 0.05 level of confidence.

Chapter - V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Man is destined to keep moving throughout his life. He started moving inside his mother's womb and he should stop moving only when he is dead. Human development in the field of science and technology has made humankind invariably lazy and lead a sedentary life. The science and technology is advancing in a rapid speed that the life styles of humans are becoming very convenient. The people those who invent for humanity are of the view that their inventions would help humans to live happily. But the results are reverse. Their inventions make the human population skip walking, abolish climbing staircases and eliminate even simple movements. The human effort in their daily living is taken care of by machines. Machines and materials have made humans more lethargic and spend their times in a chair. This is one of the reasons for health problems at later stage.

Physical fitness should be an important part of all people's life no matter what age or gender. A healthy life style is something that will not only help us to live longer but will help the years we live to be more enjoyable. Everyone needs good nutrition and physical activity to give their bodies the best possible chance of health and longevity. Exercise is an essential component of fitness during which endorphins are released which helps teens deal with stress. Thus, being fit can be a way for teens to let off stress. Physical activity is a healthy outlet for problems like anger and stress that tend to plague teenagers during the difficult transition into adulthood.

5.1. Summary

The aim of this study was to provide two different treatments in combination with the yoga training to sensitize female population about the other physical activities which may contribute for their fitness avoiding monotony of activity thereby helping them to find

peace and immunity, improved abilities and processing efficiency with their abilities and skills. The scholar tried diet restriction to one experimental group and combined yoga and diet restriction to another experimental group. It would contribute to the society at large to have a healthy and active life if the experiments in the study are proved encouraging.

The independent variables chosen for this noble cause were Yoga, Diet Restriction and the Combination of Yoga and Diet Restriction. Keeping yoga training as a constant, diet restriction and yoga were combined to try out a new, innovative and a really interesting package. One group performed yoga for five days a week, and the second group had only diet restriction and the third group had yoga training for five days a week with diet restriction like the second group.

Taking into considerations of our housewives and the employed women, the scholar chose to help them by improvising some exercises which are very simple and easy to do without the regular discomforts of exercises like sweating and heat. Also, he devised some dieting pattern with a slight change in their daily routine. He prescribed some corns, roots, leaves and gooseberry as a supplement.

The scholar made an attempt to compare selected motor, physiological and biochemical variables among women of age groups between 35 and 45 years to find a suitable solution for this abiding problem and to help the housewives to have a better physical and mental health conducted a study. The present study was to compare the selected motor fitness, physiological and biochemical variables among women of age between 35 and 45 years. To achieve this purpose, 120 female walkers who had not participated in any form of competitive sports from Ambattur town in Chennai city were selected at random for this study. They were selected from among 200 regular walkers in the park to reduce their body weight. After briefing, 120 women volunteers were selected. They were explained about their role in the study and they were requested to extend their best cooperation in making the purpose of the study meaningful and useful to other public at large.

Important factors that were considered as the real factors that contributed in the gaining of body weight reduced the activity levels and increased the vital signs and those raised blood lipids and blood sugar were selected as the criterion variables. The variables selected were motor fitness variables line agility, hip flexibility and leg power that were important in deciding the mobility of the people who are sedentary, the physiological variables that attributed the accumulation of adipose body fat that make them heavy and restricted their movement and they were indicators of their general health like body mass index, pulse rate and systolic pulse rate. The biochemical variables that are the outcome of their life styles and the sedentary life style like the LDL, HDL and the blood sugar. They were classified as the criterion variables and independent variables as detailed below and studied with simple tests which needed less training and easy to perform for assessment.

Yogic Exercise Group consisted of 30 women who performed a set of 6 yogasanas three times daily for 45 minutes for five days in a week under the supervision of the scholar in the school auditorium between 5 and 6 pm. The schedule is given below. They brought their own yoga mattress and after every session the feedback from the participants and they were counseled properly. Each asana was done for 10 to 15 seconds to the ability of individuals.

The Diet regulated group consisted of 30 female subjects, who were asked to follow a regulated diet pattern, Morning after getting up, they were asked to take 100 ml of a juice prepared by themselves at home with gooseberry, ginger, garlic and mint leaves. The method of preparation and the quantity of each constituent were demonstrated to the group before the experiment and the scholar was satisfied with their preparation.

Combined Group consisted of 30 female subjects of the same age group and they were given yoga training same as the Yogic Exercise group and performed a set of 6 yoga asanas three times daily for 45 minutes for five days in a week under the supervision of the scholar in the school auditorium between 5 and 6 pm. They brought their own yoga mattress and after every session the feedback from the participants and they were counseled properly. They were also instructed to follow the same type of food prescribed for the diet regulated group. Then for the breakfast, they were asked to replace their regular menu with rice preparations and supplement it with ragi porridge, the method of preparation of which was also demonstrated to

all the subject by the researcher. The quantity of intake was left to the participants. Evening snacks was permitted to their taste. Afternoon lunch was permitted to their choice with rice preparations. They were advised to restrict the intake of eggs, mutton and beef during the period of the experiment. Night dinner with rice or other preparations they usually take was replaced by ragi idly. The method of preparation of which was also demonstrated by the researcher. The quantity of intake was left to the participants. This group was allowed to do their regular work but they were not permitted to be a part of any organized physical activities and competitions.

Agility was measured using Boomerang Run (Right) test by marking with plastic cones as prescribed in the basketball mud court for all the subjects. The same procedure was performed once before the experiment and next after 12 weeks after the experiment

Hip Flexibility was measured by using the Sit and Reach apparatus inside the auditorium of the school and noted in centimeters for all the subjects. The same procedure was performed once before the experiment and next after 12 weeks after the experiment

The leg explosive power was measured by using the marked standing broad jump mattress inside the school auditorium for all the 120 subjects. The same procedure was performed once before the experiment and next after 12 weeks after the experiment.

Body Mass Index was calculated by using the formula (***Ht. in Mtrs)^2/ Body weight in Kgs)***. The weight of all the subjects were measured using a calibrated weighing machine in kilograms, and a accurately calibrated Stadiometer was used t measure the exact height of the subjects. Then, the body mass index was calculated by applying the above formula and recorded in numbers as ratio. The same procedure was performed once before the experiment and next after 10 weeks after the experiment.

Resting pulse rate test was recorded in rate per minute. The pulse rate of all the subjects were recorded in a sitting position in the morning session between 6.00am and 7.00am; before taking the pulse rate, the subjects were asked to sit on a chair and relax for 15min. To record the pulse rate, the three fingertips were placed on the left radial artery at the

wrist in such a manner that pulse was clear and the number of pulse were counted for 15 seconds and converted to one minute. The same procedure was performed once before the experiment and next after 12 weeks after the experiment.

The systolic blood pressure was measured for all the subjects in the morning on two occasions by a qualified physician using a Sphygmomanometer, once before the experiment and next after the completion of the experimental period. The scores thus collected were recorded in mmHg. The same procedure was performed once before the experiment and next after 12 weeks after the experiment.

Low density lipoprotein, high density lipoprotein and random blood sugar were measured on the same day in the school campus. The qualified lab technician collected the blood samples from all the subjects by 10 am. The subjects assembled there for the test and after verification from the subjects that they did not take any food with more fat, the technician collected the blood samples. After testing the blood for lipids and random sugar, the data were collected from the laboratory and recorded in mg/dL. The same procedure was performed once before the experiment and next after 12 weeks after the experiment.

The data were collected from the Yoga, Diet Regulated and the combined groups on selected motor, physiological and biochemical variables among women of age groups between 35 and 45 years. The experimental design for the study was static group comparison design. Analysis of covariance ANCOVA (*Analysis of covariance* n.d) was used to find out the difference among the Yoga, Diet Regulated and the Combined groups on selected motor, physiological and biochemical variables. As the obtained F-ratio was significant, the Scheffe's test was used as a post-hoc test to find out the significant difference between each variable. In all the cases, 0.05 level of significance was used to test the hypotheses.

The following chart would give a clear picture of the results obtained in terms of obtained F-ratios.

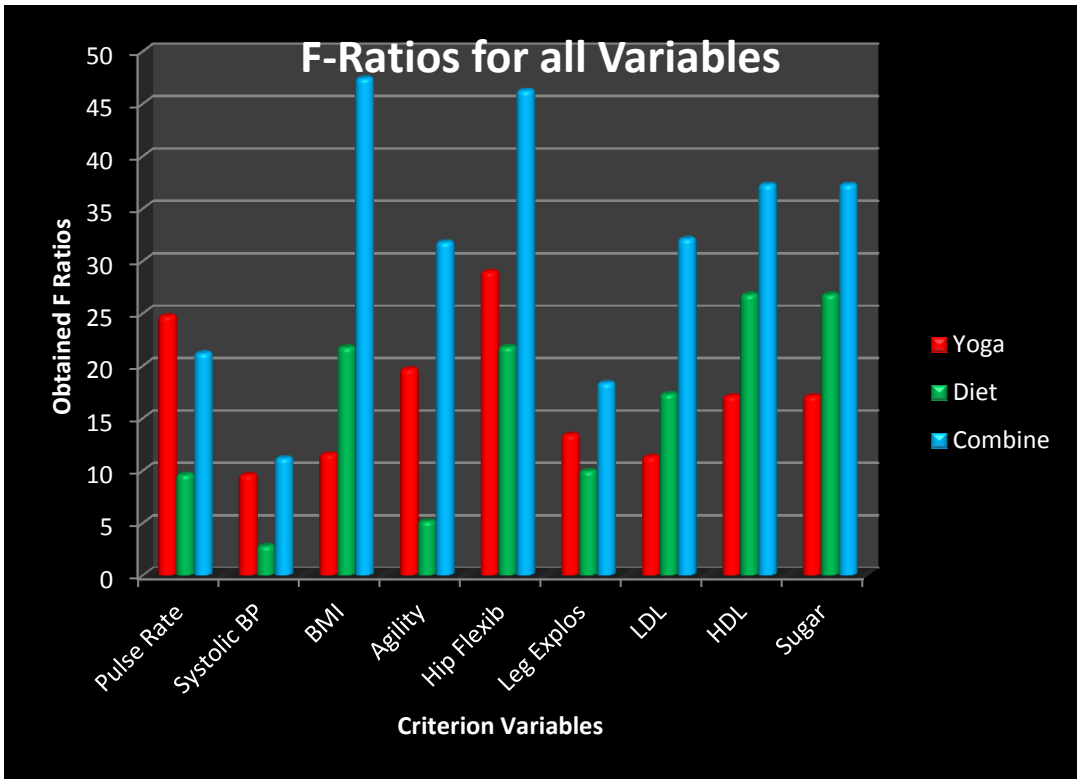

Fig. 5.1 Comparison of F-ratios of all the criterion variables

5.2. Conclusions

1. It was inferred that the Combined Group had improved the Agility level , Hip Flexibility Level and Body Mass Index level than the Yogic Group and the Dieting Group.

2. It was inferred that the Combined Group had improved the Systolic Blood Pressure level than the Yogic Exercise Group and Diet Regulated Group.

3. The Yogic Exercise Group had improved the Low Density Lipoprotein level than the Diet Regulated Group and the Combined Group.

4. It was inferred that the Combined Group had improved the High Density Lipoprotein level and the Random Blood Sugar levels than the Diet Regulated Group and the Yogic Exercise Group

5.3. Recommendations

1. This type of study might help to find out the obesity levels of adolescent boys and girls.

2. This juice of gooseberry, ginger, mint leaves and garlic might open a flood gate to reduce the lipid levels of obese men, women and children.

3. This same juice might help in reducing the BMI levels and the Random Blood sugar levels.

4. This study may be conducted for men of age above 50 years to improve their mobility

5. The combined programme may be tested for school boys and girls.

6. Different type of diet restrictions could be implemented to improve the vital signs

5.4. Feedback after training

5.4.1 Yogic exercise group

The subjects of the yogic exercise group felt that they were able to bend easily and were able to perform their daily activities with ease and without much fatigue. They expressed their desire to continue their routine with yoga at least twice a week and their resolute to take more people into their confidence as their mates for the sake of continuity and to teach what they know to others. It was encouraging that the subjects purchased special and convenient dress for them during the course of the training and it showed their firm commitment to continue this programme for their physical well being. The members of this group, felt that they had lost weight from 1 kilogram to 2 kilograms in the course of 12 weeks. Though it could not be established statistically, at least 20 % of the group members would have lost some weight. They felt light and they fit into their dresses easily than before.

5.4.2. Diet regulated group

The diet regulated group prepared their own morning juice with gooseberry, ginger, garlic and mint leaves. At the end of the training period, they expressed their gratitude to the scholar, since those who could not sit on floor and climb stair cases could do so right from the third week of the training. Many of the participants expressed their opinion that they feel light and conveyed the scholar that they had their weights reduced from 1 kilogram to 3 kilograms in the period of training. They found the diet with ragi as porridge and idly was very much fruitful and they assured that they would try the same type of this diet routine to their husbands also. It was very heartening to note that this dieting routine needs further large scale testing with mixed population. Now that they had got free from the knee joint pains and general feeling of fitness, they proposed to perform yoga exercises with other participants of the yoga exercise group. Once again, the author assured that this juice in the morning did not have any side effects but it normalized constipation, improved appetite, and reduced the body mass index. The subjects expressed that their blood sugar level was under control and some reported that their sugar level had come down. They also felt that the lipid levels also found to be reduced due to this training.

5.4.3. Combined training group

The combined training group had the privilege of performing yogic exercises and followed the diet regulation. Initially, some people, who were unable to perform some asanas, started doing along with others with ease in the course of 3rd week. They felt that they were feeling more flexible. They had less pain in the joints when they participated in the yogic training sessions. They also expressed that they had lost 1 to 3 kilograms of weight at the end of the training session. The scholar felt that the diet regulation with yoga would definitely keep the people be agile, flexible, get the BMI reduced, and keep the other biochemical parameters like blood sugar and lipids under control. A larger study in this area was recommended by the scholar. The scholar felt that there was great scope in studying with different populations to establish the importance of the amla juice, ragi diet and yoga.

REFERENCES

- Arun, JM 2015, 'Flexibility-A study on the effect of yogasanas and aerobic exercises', *Global Journal of Multidisciplinary Studies*, vol. 4 no. 7, pp. 77-79

- Ashish Contractor, Leena Mogre & Purwa Duggal 2015, 'The Cholesterol Factor', *The Reader's Digest*. vol. 56, no.5, pp. 44-47

- Böhm, M, Reil, JC, Deedwania, P, Kim, JB & Borer, JS 2015, 'Resting heart rate: risk indicator and emerging risk factor in cardiovascular disease', *The American Journal of Medicine*, vol. 128, no. 3, pp. 219-228

- Bottaro, M, Machado, SN, Nogueira, W, Scales, R & Veloso, J 2007, 'Effect of high versus low-velocity resistance training on muscular fitness and functional performance in older men', *European Journal of Applied Physiology*, vol. 99, no. 3, pp. 257-264

- Brown, R & Chevalier, G 2015, 'Grounding the Human Body during Yoga Exercise with a Grounded Yoga Mat Reduces Blood Viscosity', *Open Journal of Preventive Medicine*, vol.5, no. 4, pp. 159

- Brown, T, Smith, S, Bhopal, R, Kasim, A & Summerbell, C 2015, 'Diet and Physical Activity Interventions to Prevent or Treat Obesity in South Asian Children and Adults: A Systematic Review and Meta-Analysis', *International Journal of Environmental Research and Public Health*, vol. 12, no. 1, pp. 566-594

- Chaturvedi, A, Nayak, G, Nayak, AG, Sharma, V, Devi, AS & Rao, A 2015, 'Efficacy of yoga in balancing the deranged biochemical profile in healthy perimenopausal women hailing from South Kanara district of Karnataka India', *Asian Journal of Biomedical and Pharmaceutical Sciences*, vol. 5, no. 45, pp. 20-25

- Clarke, HH & Clarke, DH 1972, Advanced Statistics, with Applications to Physical Education. Prentice-Hall Inc., Englewood Cliffs, New Jersey

- Colado, JC & Triplett, NT 2008, 'Effects of a short-term resistance program using elastic bands versus weight machines for sedentary middle-aged women', *The Journal of Strength & Conditioning Research*, vol. 22, no. 5, pp. 1441-1448

- Dabrowska, J, Dabrowska-Galas, M, Naworska, B, Wodarska, M, & Plinta, R 2015, 'The role of physical activity in preventing obesity in midlife women', *Przeglad Menopauzalny*, vol. 14, no. 1, pp -13

- Dietz, WH & Bellizzi, MC 1999, 'Introduction: the use of body mass index to assess obesity in children', *The American Journal of Clinical Nutrition*, vol. 70, no. 1, pp. 123-125

- Dixit, AA, Azar, KM, Gardner, CD & Palaniappan, LP 2011, 'Incorporation of whole, ancient grains into a modern Asian Indian diet to reduce the burden of chronic disease', *Nutrition reviews*, vol. 69, no. 8, pp. 479-488

- Djoussé, L & Gaziano, JM 2008, 'Egg consumption in relation to cardiovascular disease and mortality: the Physicians' Health Study', *The American Journal of Clinical Nutrition*, vol.87, no. 4, pp. 964-969

- Dutta, K & Singh, S 2014, 'Applying the Theory of Planned Behavior to Understand Indian Housewives Purchase Behavior Towards Healthy Food Brands', *IUP Journal of Brand Management*, vol. 11, no. 4, pp. 7

- Errickson, SP, Kolotkin, RL, Skidmore, MS, Endress,G, Østbye, T, Crosby, R & Eisenson, H 2015, 'Improvements in Functional Exercise Capacity after a Residential Behavioural Change, Diet and Fitness Program for Obese Adults', *Physiotherapy Research International*, vol. 18, no.4, pp.225-229

- Foushee, DB, Ruffin, J & Banerjee, U 1981, 'Garlic as a natural agent for the treatment of hypertension: a preliminary report', *Cytobios*, vol. 34 no.135-36, pp. 145-152

- Gadham, J & Srikanth Sajja, VR, 2015, 'Effect of Yoga on obesity, hypertension and lipid profile', *International Journal of Research in Medical Sciences*, vol.3, no. 5, pp. 1061-1065

- Ghasemzadeh, A, Jaafar, HZ & Rahmat, A 2010, 'Antioxidant activities, total phenolics and flavonoids content in two varieties of Malaysia young ginger (Zingiber officinale Roscoe)', *Molecules*, vol. 15, no. 6, pp. 4324-4333

- Goyal, RK, Shah, VN, Saboo, BD, Phatak, SR, Shah, NN, Gohel, MC et al. 2010, 'Prevalence of overweight and obesity in Indian adolescent school going children: its relationship with socioeconomic status and associated lifestyle factors', *The Journal of the Association of Physicians of India*, vol. 58, no.7, pp. 151-158

- Halder, K, Chatterjee, A, Pal, R, Tomer, OS & Saha, M 2015, 'Age related differences of selected Hatha yoga practices on anthropometric characteristics, muscular strength and flexibility of healthy individuals', *International Journal of Yoga*, vol. 8, no.1, pp. 37

- Hegde, SV, Adhikari, P, Kotian, S, Pinto, VJ, D'Souza, S & D'Souza, V 2011, 'Effect of 3-Month Yoga on Oxidative Stress in Type 2 Diabetes With or Without Complications A controlled clinical trial', *Diabetes care*, vol. 34, no. 10, pp. 2208-2210

- Heitmann, BL 1992, 'The effects of gender and age on associations between blood lipid levels and obesity in Danish men and women aged 35–65 years', *Journal of Clinical Epidemiology*, vol. 45, no. 7, pp. 693-702

- Hopkins, R, 2015, 'Prescribing garlic: Clinical considerations from constituents to potential drug interactions healing', *Journal of the Australian Traditional-Medicine Society*, vol. 21, no.1, pp. 65-67

- Hossain, P, Kawar, B, & El Nahas, M 2007, 'Obesity and diabetes in the developing world—a growing challenge', *New England Journal of Medicine*, vol. 356, no.3, pp. 213-215

- Hruda, KV, Hicks, AL & McCartney, N 2003, 'Training for muscle power in older adults: effects on functional abilities', *Canadian Journal of Applied Physiology*, vol. *28, no.* 2, pp. 178-189

- Jabs, J, Devine, CM, Bisogni, CA, Farrell, TJ, Jastran, M & Wethington, E 2007, 'Trying to find the quickest way: employed mothers' constructions of time for food', *Journal of Nutrition Education and Behavior*, vol. 39, no. 1, pp. 18-25

- Kajale, NA, Khadilkar, AV, Chiplonkar, SA & Khadilkar, V 2015, 'Changes in body composition in apparently healthy urban Indian women up to 3 years postpartum', *Indian Journal of Endocrinology and Metabolism*, vol.19, no.4, pp. 477 – 479

- Kehoe, SH, Chopra, H, Sahariah, SA, Bhat, D, Munshi, RP, Panchal, F et al. 2015, 'Effects of a food-based intervention on markers of micronutrient status among Indian women of low socio-economic status', *British Journal of Nutrition*, vol. 113, no. 5, pp. 813-821

- Khanna, S, Das, A, Spieldenner, J, Rink, C & Roy, S 2015, 'Supplementation of a Standardized Extract from Phyllanthus emblica Improves Cardiovascular Risk Factors and Platelet Aggregation in Overweight/Class-1 Obese Adults', *Journal of Medicinal Food*, vol.18, no. 4, pp. 415-420

- Kumar, D, Trivedi, N & Dixit, RK 2015, 'Herbal Medicines Used in the Traditional Indian Medicinal System as a Therapeutic Treatment Option For Diabetes management: A Review', *World Journal Of Pharmacy And Pharmaceutical Sciences*, vol. 4, no. 4, pp.368-385

- Kumar, KS, Bhowmik, D, Dutta, A, Yadav, AP, Paswan, S, Srivastava, S & Deb, L 2012, 'Recent trends in potential traditional Indian herbs Emblica officinalis and its medicinal importance', *Journal of Pharmacognosy and Phytochemistry*, vol. 1, no. 1, pp. 18-28

- Kwon, YI, Apostolidis, E, Kim, YC & Shetty, K 2007, 'Health benefits of traditional corn, beans, and pumpkin: in vitro studies for hyperglycemia and hypertension management', *Journal of Medicinal Food*, vol. 10, no. 2, pp. 266-275

- Mahalingam, M & Vairamani, S 2015, 'Comparative Study Of 6-Week Aerobics Training And Suryanamaskar Programs On Agility And Flexibility', *International Journal of Applied Environmental Sciences*, vol. 10, no. 3, pp. 843-856

- Mahalingam, M & Vairamani, S 2015, 'Effects Of An 8-Week Twin Exercise Program On Functional Fitness In 40 To 50 Year Old Women', *International Journal of Applied Engineering Research*, vol. 10, no. 7, pp. 18407-18416

- Malhotra, A, Noakes, T & Phinney, S 2015, 'It is time to bust the myth of physical inactivity and obesity: you cannot outrun a bad diet', *British Journal of Sports Medicine*, vol. 42, no.84, pp.548–560

- McCaffrey, R, Ruknui, P, Hatthakit, U & Kasetsomboon, P 2005, 'The effects of yoga on hypertensive persons in Thailand', *Holistic Nursing Practice*, vol. 19, no. 4, pp. 173-180

- Mishra, MK, Pandey, AK., & Dubey, S 2015, 'Effect of eight weeks yogic training on selected physiological variables', *International Journal of Physical Education, Sports and Health 2015,* vol.1, no. 3, pp. 50-52

- Misra, A & Khurana, L 2008, 'Obesity and the metabolic syndrome in developing countries', *The Journal of Clinical Endocrinology & Metabolism*, vol. 93, no. 11-supplement-1), pp 9-30

- Misra, A, Sharma, R, Gulati, S, Joshi, SR, Sharma, V, Ibrahim, A & Bhardwaj, S 2011, 'Consensus dietary guidelines for healthy living and prevention of obesity, the metabolic syndrome, diabetes, and related disorders in Asian Indians', *Diabetes Technology & Therapeutics*, vol. 13, no. 6, pp. 683-694

- Mondal, J, Balakrishnan, R & Krishnamurthy, MN 2015, 'Regulation of autonomic functions following two high frequency yogic breathing techniques', *TANG*, vol. 5, no. 1, pp. 19-22

- Mondal, S, Kundu, B & Saha, S 2014, 'Blood Sugar and Lipid Profile Adaptations to Yoga Therapy', *Journal of Yoga & Physical Therapy*, vol. 4, no. 4, pp. 1

- Nakamura, Y, Tanaka, K, Yabushita, N, Sakai, T & Shigematsu, R 2007, 'Effects of exercise frequency on functional fitness in older adult women', *Archives of Gerontology and Geriatrics*, vol. 44, no. 2, pp. 163-173

- Padmini, E, Valarmathi, A & Rani, MU, 2010, 'Comparative analysis of chemical composition and antibacterial activities of Mentha spicata and Camellia sinensis', *Asian Journal of Experimental Biological Science*, vol.1, no. 4, pp. 772-781

- Patel, NS & Thacker, NJ 2014, 'Effect of Aerobic Exercise on Psychological Well-Being of Housewives', *International Journal of Health Sciences and Research (IJHSR)*, vol. 4, no. 11, pp. 159-165

- Rachiwong, S, Panasiriwong, P, Saosomphop, J, Widjaja, W & Ajjimaporn, A 2015, 'Effects of Modified Hatha Yoga in Industrial Rehabilitation on Physical Fitness and Stress of Injured Workers', *Journal of Occupational Rehabilitation*, vol. 6, no.3, pp. 1-6

- Ramachandran, A, Snehalatha, C, Vinitha, R, Thayyil, M, Kumar, CS & Sheeba, L et al. 2002, 'Prevalence of overweight in urban Indian adolescent school children', *Diabetes Research and Clinical Practice*, vol. 57, no. 3, pp. 185-190

- Ramos-Jiménez, A, Wall-Medrano, A, Corona-Hernández, RI & Hernández-Torres, RP 2015, 'Yoga, bioenergetics and eating behaviors: A conceptual review', *International Journal of Yoga*, vol. 8, no. 2, pp. 89

- Rhéaume, C, Arsenault, BJ, Després, JP, Boekholdt, SM, Wareham, NJ, Khaw, KT & Chir, M 2014, 'Impact of abdominal obesity and systemic hypertension on risk of coronary heart disease in men and women: the EPIC-Norfolk Population Study', *Journal of Hypertension*, vol. 32, no. 11, pp. 2224-2230

- Saha, S 2015, 'Effects of yogic practice on lipid profile in elderly women with type 2 diabetes mellitus', *Indian Journal of Research*, vol. 4, no. 1, pp. 149-151

- Sawane, MV & Gupta, SS 2015, 'Resting heart rate variability after yogic training and swimming: A prospective randomized comparative trial', *International Journal of Yoga*, vol. 8, no. 2, pp. 96

- Sekhar, KC, Deotale, PG & Reddy, SS 2015, 'A Study on Assessment of Obesity among High School Children in Urban Area of Eluru, Andhra Pradesh', *Indian Journal of Public Health Research & Development*, vol. 6, no. 2, pp. 7-11

- Shidfar, F, Rajab, A, Rahideh, T, Khandouzi, N, Hosseini, S & Shidfar, S 2015, 'The effect of ginger (Zingiber officinale) on glycemic markers in patients with type 2 diabetes', *Journal of Complementary and Integrative Medicine*, vol. 12, no. 2, pp. 165-170

- Stacey, D, Jull, J, Beach, S, Dumas, A, Strychar, I, Adamo, K & Prud'homme, D 2015, 'Middle-aged women's decisions about body weight management: needs assessment and testing of a knowledge translation tool', *Menopause*, vol. 22, no. 4, pp. 414-422

- Trent, LK & Conway, TL 1988, 'Dietary factors related to physical fitness among navy shipboard men', *American Journal of Health Promotion*, vol. 3, no. 2, pp. 12-25

- Zmijewski, P, Mazurek, K, Kozdron, E, Szczypiorski, P & Frysztak, A 2015, 'Effects of Organized Physical Activity on Selected Health Indices among Women Older than 55 Years', *The Scientific World Journal*, vol. 2015, no.1, pp. 1-8

WEB REFERENCES

- *Agility* n.d., viewed august 20 2014, www.vocabulary.com/dictionary/agility
- *Analysis of covariance* n.d. viewed january 10 2014 <http://www.dynamicdrive.com/> and <http://vassarstats.net/textbook/>
- Ananya Govindarajan, (2015) http://www.thehindu.com/tag/physical-fitness/1137/ 7th July 2015, pp. 17
- *Balanced diet* n.d., viewed October 4 2013, http://www.nutracheck.co.uk/Library/Healthy-Eating/how-to-get-a-healthy-balanced-diet_1.html
- *Boomerang Run (Right) n.d*. viewed march 15, 2013http://lermagazine.com/wp-content/uploads/2012/06/6AnkleBracing-ambegaonkar.jpg
- *Explosive Power* n.d., viewed september 24 2014, http://www.thefitmap.com/exercise/essentials/power/index.htm
- *Garlic n.d.* viewed february 9 2013< http://www.nutrition-and-you.com/garlic.html>
- *Ginger n.d.* viewed february 9 2013 <http://www.medicalnewstoday.com/articles/265990.php>
- *Gooseberry* n.d. viewed february 9 2013< http://www.homeremedyshop.com/20-health-benefits-of-indian-gooseberry/>
- *High Density Lipoprotein* n.d., viewed july 28 2014, <http://www.medicinenet.com/ script/main/art.asp?articlekey=3662>
- *Hip Flexibility* n.d., viewed august 20 2014, < http://study.com/academy/lesson/what-is-range-of-motion-rom-definition-types-testing-exercises.html>
- *Low-density lipoprotein* n.d., viewed july 28 2014, <http://www.medicinenet.com/ script/main/art.asp?articlekey=6232>
- *Obesity* n.d., viewed september 24 2014, <http://www.mayoclinic.org/diseases-conditions/obesity/basics/definition/con-2001483416>
- *Pudina n.d.* viewed february 9 2013 < https://www.organicfacts.net/health-benefits/herbs-and-spices/health-benefits-of-mint.html>
- *Ragi food preparation* n.d. viewed March 2013 <http://timesofindia.indiatimes.com/life-style/health-fitness/diet/Benefits-of-Ragi/articleshow/10288786.cms>

- *Random glucose test* n.d., viewed july 28 2014, <https://en.wikipedia.org/wiki/Random_glucose_test>

- *Sit and Reach test* n.d. viewed march 15 2013 <http://www.onemoveforward.com/wp-content/uploads/2012/06/health-assessment-2.jpg>

- *Systolic blood Pressure* n.d., viewed july 28 2014, < http://www.webmd.com/hypertension-high-blood-pressure/guide/diastolic-and-systolic-blood-pressure-know-your-numbers>

- *Yogasanas* n.d. viewed january 10 2013 <http://www.a2zyoga.com/yoga-poses>

Appendix I

Raw Scores of Agility (seconds)

Yoga Group		Dieting Group		Combined Group		Control Group	
Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**	**Initial**	**Final**
24.2	22.8	24.3	23.1	24.2	22.8	24.2	24.3
20.2	18.1	22.4	19.2	20.2	18.2	20.2	22.4
24.8	22.2	23.8	22.2	24.8	22.5	24.8	23.8
30.0	30.1	29.6	29.3	30.0	28.6	30.0	29.6
28.0	26.4	28.7	29.4	29.3	27.4	28.0	28.7
22.2	19.2	23.2	22.5	22.2	20.8	22.2	23.2
22.0	20.1	22.2	21.6	21.0	18.9	22.0	22.2
24.5	22.5	24.4	24.7	24.5	22.5	24.5	24.4
26.0	23.8	26.3	23.8	25.3	22.0	26.0	26.3
26.0	24.2	25.6	24.9	24.5	23.8	26.0	25.6
22.0	20.4	22.7	20.0	21.2	20.1	22.0	22.7
24.0	22.0	23.1	23.1	22.4	22.2	24.0	23.1
23.0	20.5	22.6	22.2	24.5	24.1	23.0	22.6
26.0	23.8	24.5	31.8	30.8	28.9	26.0	24.5
25.0	22.6	25.2	23.9	24.1	22.0	25.0	26.8
22.0	21.8	23.2	20.5	27.8	26.6	22.0	22
26.0	24.5	25.3	24.6	26.9	24.8	26.0	25.3
26.0	24.8	24.4	22.5	27.8	27.4	26.0	25.8
24.0	23.0	24.2	26.7	24.5	24.4	24.0	24.2
30.0	30.1	29.7	28.1	30.8	32.4	30.0	30.1
24.5	24.0	25.9	24.3	24.5	20.0	24.5	25.9
26.0	24.8	26.2	23.5	25.3	22.0	26.0	25.4
26.0	24.4	25.3	24.7	24.5	20.1	26.0	25.3
22.0	20.4	22.5	20.8	21.2	16.0	22.0	21.8
24.0	23.8	23.6	23.0	22.4	16.0	24.0	23.6
23.0	22.1	22.8	22.2	22.0	18.4	24.0	22.8
22.2	21.6	23.9	22.4	22.2	19.2	22.2	23.9
23.0	21.0	21.9	21.6	21.0	18.8	23.0	21.9
26.7	23.4	25.2	24.8	24.5	23.6	24.5	25.2
25.9	23.8	24.2	23.0	24.2	23.1	24.2	24.2

Appendix II

Raw Scores of Hip Flexibility (centimeters)

Yoga Group		Dieting Group		Combined Group		Control Group	
Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**	**Initial**	**Final**
8	10	8	8	10	12	16	17
15	16	15	18	16	18	20	17
12	14	12	16	12	15	18	18
9	12	9	13	13	16	10	11
15	17	15	18	17	20	11	10
18	19	20	23	16	18	10	10
22	25	20	22	19	20	10	11
12	15	18	18	15	18	11	11
10	12	12	14	11	13	10	10
13	18	11	12	13	18	10	9
16	17	12	14	15	15	17	18
20	22	19	20	18	18	19	20
18	20	17	19	17	19	18	17
10	12	12	12	11	13	12	12
10	10	11	12	10	12	11	12
10	12	8	10	11	13	12	11
10	11	9	11	10	11	11	12
11	12	12	13	11	14	12	13
10	10	10	12	13	13	11	12
10	12	8	10	8	9	10	9
10	10	8	10	10	12	15	17
15	18	14	16	16	19	22	23
12	14	11	12	12	14	17	15
10	13	9	12	10	14	13	12
15	17	15	17	18	20	12	12
18	20	19	20	17	21	11	12
22	25	21	23	17	20	12	12
13	15	13	13	12	15	11	11
10	12	14	12	9	12	14	13
14	12	13	12	9	12	12	12

Appendix III

Raw Scores of Leg Explosive Power (centimeters)

Yoga Group		Dieting Group		Combined Group		Control Group	
Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**	**Initial**	**Final**
8	9	6	8	12	14	8	9
12	13	14	12	15	18	20	19
11	13	13	14	13	15	22	20
7	8	9	12	10	12	10	8
7	10	14	15	13	17	12	10
15	16	19	21	16	18	15	16
21	22	22	24	23	24	21	22
18	19	15	15	12	13	15	15
19	20	22	20	12	14	12	13
17	18	8	10	17	19	17	18
19	20	10	11	16	18	19	20
19	19	20	22	20	22	19	19
22	24	18	19	16	18	18	17
20	22	20	22	14	12	13	15
22	22	18	20	20	20	22	20
18	19	10	12	9	10	10	12
9	10	11	11	10	13	9	11
11	12	10	11	10	14	10	11
10	12	12	14	12	10	10	10
11	11	14	16	15	16	16	15
18	18	16	15	15	16	13	15
19	23	21	22	22	23	23	22
17	18	18	18	17	20	14	13
19	20	20	22	21	21	20	17
19	19	20	22	24	25	20	18
22	24	23	24	22	22	18	19
18	18	19	19	20	22	21	21
9	10	13	13	14	13	15	14
11	12	10	12	10	12	10	11
10	12	12	11	12	12	10	10

Appendix - IV

Raw Scores of Body Mass Index

Yoga Group		Dieting Group		Combined Group		Control Group	
Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**	**Initial**	**Final**
28	24	28	28	28	27	22	28
30	27	26	25	28	26	30	26
29	28	30	29	27	26	29	30
35	32	28	28	27	26	35	28
31	30	29	27	28	26	31	29
29	27	26	25	27	25	29	26
25	27	32	27	29	26	25	32
26	26	29	27	30	27	26	29
30	28	27	25	30	26	30	27
27	27	29	26	30	26	27	29
27	26	30	27	30	25	24	30
29	27	28	26	27	25	29	28
26	28	32	28	30	24	26	32
28	27	27	26	28	24	28	27
31	29	30	27	27	25	31	30
28	26	28	29	28	24	28	28
28	27	30	27	28	24	28	30
27	25	25	26	27	26	27	25
26	25	24	24	28	27	26	24
28	27	25	24	29	26	24	25
27	26	26	26	29	27	28	27
26	25	27	26	29	26	30	26
28	26	27	25	29	26	29	27
27	26	28	26	28	26	29	27
28	26	30	27	28	26	29	27
28	27	28	26	28	26	28	28
26	26	31	28	28	26	28	28
29	27	30	27	28	26	30	30
33	30	28	26	28	26	33	32
30	28	28	27	28	26	32	32

Appendix V

Raw Scores of Resting Pulse Rate (beats / minute)

Yoga Group		Dieting Group		Combined Group		Control Group	
Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**	**Initial**	**Final**
76	76	88	84	84	84	88	84
80	80	88	88	88	88	88	88
84	80	88	84	88	88	88	88
80	76	84	84	88	84	84	84
84	80	80	80	80	80	80	80
88	84	84	80	84	84	84	84
84	80	84	84	84	80	88	88
84	80	84	84	84	80	88	85
88	88	84	80	84	76	76	80
88	84	80	80	80	80	84	80
84	80	84	88	84	76	80	80
84	80	84	80	84	76	80	84
80	76	80	80	80	76	80	80
84	84	84	84	84	80	84	84
88	84	88	84	84	80	84	84
88	84	84	84	84	80	84	84
88	84	84	84	84	84	84	84
76	80	80	84	84	84	84	84
88	84	84	80	84	80	88	84
84	80	84	84	84	80	88	86
84	80	84	76	84	80	80	80
80	76	80	76	84	80	84	88
88	84	84	84	84	84	88	88
80	76	80	80	84	80	84	84
84	80	84	80	80	80	88	88
84	80	88	80	84	80	88	84
84	80	88	84	84	80	84	84
84	80	88	84	84	84	84	84
88	84	88	80	88	84	88	88
88	84	84	80	84	80	88	84

Appendix - VI

Raw Scores of Systolic Blood Pressure (mm Hg)

Yoga Group		Dieting Group		Combined Group		Control Group	
Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**	**Initial**	**Final**
125	120	145	143	130	130	140	130
121	118	116	110	118	125	130	130
117	118	127	130	132	120	125	120
112	110	130	115	140	135	140	135
159	144	140	125	142	140	140	145
123	125	117	120	140	140	130	135
118	115	115	120	134	130	120	126
114	110	127	120	140	130	130	123
110	114	140	114	125	120	130	134
156	127	140	135	139	140	116	110
152	140	140	120	116	110	140	140
147	140	110	120	130	130	140	130
143	140	122	120	150	130	119	120
139	130	133	130	122	120	140	140
134	130	132	130	150	140	129	130
117	115	140	150	113	110	140	140
112	110	145	130	141	135	140	130
159	140	145	145	140	115	132	140
154	150	114	130	132	120	112	140
150	140	126	116	140	142	140	140
146	131	138	140	110	110	135	130
141	135	136	140	138	115	115	120
137	130	140	140	145	110	140	140
133	133	150	120	129	130	120	120
128	120	140	140	140	140	140	140
124	120	118	120	120	120	140	140
120	120	130	140	135	110	128	130
115	110	140	130	112	120	150	140
111	110	140	140	126	120	140	140
157	140	135	135	140	130	130	130

Appendix VII

Raw Scores of Low Density Lipoprotein (mg/dL)

Yoga Group		Dieting Group		Combined Group		Control Group	
Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**	**Initial**	**Final**
118	116	135	120	135	130	130	131
132	128	131	125	150	142	104	104
128	125	132	120	130	130	130	135
121	120	120	120	132	126	135	137
118	112	128	123	136	130	125	125
132	128	131	130	130	124	123	127
125	123	130	120	120	115	130	130
125	126	132	130	120	120	120	119
132	130	136	125	120	115	120	120
143	140	140	140	135	130	124	124
122	118	125	120	135	120	118	122
134	132	126	134	125	124	117	122
125	122	132	132	135	120	126	120
124	120	130	130	130	120	128	126
120	118	126	116	130	126	130	130
150	146	129	126	120	115	132	131
120	115	135	125	126	120	134	132
132	128	130	120	130	120	136	134
130	129	128	129	130	125	138	137
120	120	135	130	143	140	135	130
160	144	160	150	125	120	140	142
140	135	127	128	136	135	140	139
147	143	128	130	130	129	144	143
135	132	133	132	130	125	140	142
126	122	132	130	140	135	145	144
132	128	122	121	142	138	150	148
130	130	134	130	119	115	135	132
128	126	110	110	119	115	128	126
132	128	135	128	127	120	132	130
130	130	126	124	141	135	134	135

Appendix VIII

Raw Scores of High Density Lipoprotein (mg / dL)

Yoga Group		Dieting Group		Combined Group		Control Group	
Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**	**Initial**	**Final**
47	57	60	45	52	57	44	42
43	53	57	53	47	54	53	51
54	60	54	49	43	51	49	47
51	54	63	41	57	60	47	41
54	57	60	57	51	57	49	51
52	53	62	49	56	59	51	52
46	53	56	61	52	53	47	44
47	53	52	53	47	49	47	45
48	51	53	53	48	50	48	44
49	51	59	51	51	56	45	49
50	52	57	52	50	54	50	48
52	58	59	55	54	56	48	49
43	48	48	46	43	45	43	39
46	50	53	47	46	50	44	41
47	49	56	47	47	53	46	44
45	49	50	46	46	47	45	45
43	51	46	43	43	43	43	41
42	49	50	43	42	47	53	49
41	46	49	46	41	46	52	50
40	43	52	41	41	49	47	45
47	53	52	49	47	49	48	47
43	46	52	46	48	49	49	49
41	51	54	56	43	51	50	47
51	56	59	53	50	56	54	53
47	53	52	55	54	49	43	41
43	51	46	47	43	43	43	41
53	53	56	50	46	53	47	39
51	54	54	53	47	51	49	49
53	56	49	59	45	46	47	48
51	56	63	56	43	60	47	47

Appendix IX

Raw Scores of Random Blood Sugar
(mg / dL)

Yoga Group		Dieting Group		Combined Group		Control Group	
Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**	**Initial**	**Final**
154	150	154	150	146	142	165	160
156	148	156	148	144	144	165	162
158	154	176	180	170	158	177	177
157	154	174	177	168	167	178	178
156	152	172	174	165	162	172	172
155	150	170	171	162	152	170	172
154	150	168	168	144	140	165	154
156	148	166	165	148	144	164	150
158	144	164	162	145	144	162	164
159	146	162	160	154	150	159	160
162	162	160	156	148	144	140	150
163	145	158	154	168	162	160	158
164	162	156	152	160	150	155	156
169	152	154	150	162	148	160	160
165	138	156	148	165	150	150	155
149	140	150	146	142	144	140	149
151	145	148	144	140	144	140	142
147	138	146	140	144	144	147	146
146	144	144	136	168	160	146	145
143	140	142	138	149	140	144	145
145	138	146	138	150	148	158	156
141	128	138	140	146	142	145	150
140	130	136	130	144	144	140	142
139	135	144	140	145	140	134	132
136	140	132	135	132	130	138	136
135	132	130	118	138	130	130	131
134	130	128	110	139	135	130	132
133	128	126	125	140	137	135	136
132	124	124	120	128	120	134	134
131	130	126	124	134	130	132	130

LIST OF PUBLICATIONS

- Mahalingam, M & Vairamani, S 2015, "Comparative Study Of 6-Week Aerobics Training And Suryanamaskar Programs On Agility And Flexibility" *International Journal of Applied Environmental Sciences*, vol. 10, no.3, pp. 843-856, (Scopus Indexed)

- Mahalingam, M & Vairamani, S 2015 "Effects of An 8-Week Twin Exercise Program On Functional Fitness In 40 To 50 Year Old Women" *International Journal of Applied Engineering Research*, vol.10, no.7, pp. 18405-18414 (Scopus Indexed)

- Mahalingam , M "Application of Science, Engineering & Technology in Sports" International Conference on at MAM College of Engineering, Tiruchirappalli on 7th and 8th December 2009

- Mahalingam, M "Combined Effects of Asanas and Dieting Regulations on Selected Body Composition and Blood Lipid Variables of Obese men above 45 Years in Chennai District" at Alagappa University, Karaikudi, on 27-28 January 2011

- Mahalingam, M "Walking for Physical Fitness and a better life " National Conference on Issues of Excellence in Academic Research" at Dr. M.G.R. Educational and Research Institute University, Maduravoyal, Chennai – 600 095 on 13th and 14th August, 2010

COMPARATIVE ANALYSIS OF YOGA, DIET REGULATED AND COMBINED GROUPS ON SELECTED MOTOR FITNESS PHYSIOLOGICAL AND BIOCHEMICAL VARIABLES AMONG OBESE WOMEN

A THESIS

Submitted by

MAHALINGAM M

in partial fulfillment for the award of the degree of

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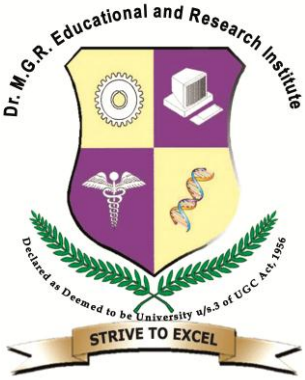

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